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In Two Sections—Section I

Parade of Lighting Progress—Annual Report

Fluorescent Lighting in the Home—Part II

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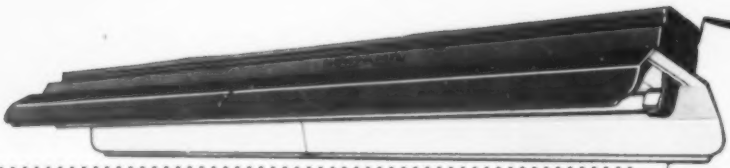

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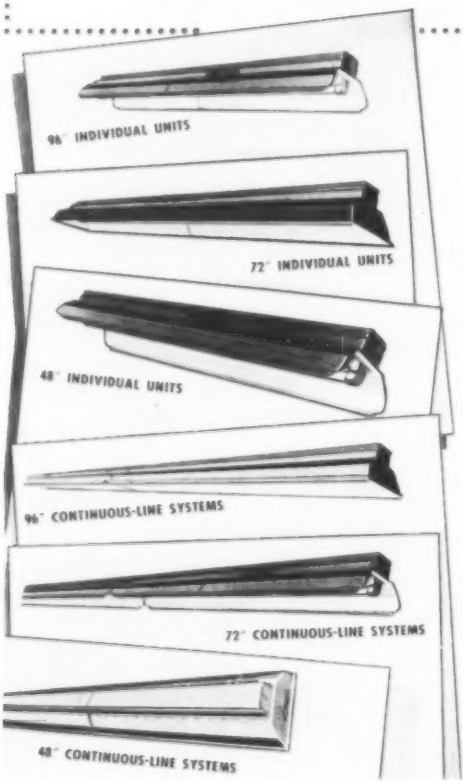

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ILLUMINATING ENGINEERING

THE JOURNAL OF THE ILLUMINATING ENGINEERING SOCIETY

IN TWO SECTIONS—SECTION II OF THE JANUARY 1952 ISSUE

Annual Indexes

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Part 1 — Subject Index

Part 2 — Telecast Subject Index

Part 3 — Personnel Index

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I.E.S. Indexes

These indexes cover the text of the twelve issues of ILLUMINATING ENGINEERING for the calendar year of 1951.

1. Subject Index.

(a) Index by title and subject of all papers, discussion, data sheets, reports and general articles.

(b) Author index.

2. Telecast—Lighting News of Current Interest.

Subject index.

3. Personnel.

(a) Personnel listing of 1950-1951 and 1951-1952 national and local officers, committees, official representatives to other organizations, local representatives. The 1951-1952 listing is complete as of November 15, 1951. For later appointments, see Index to 1952 or committee listings in ILLUMINATING ENGINEERING.

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3. PERSONNEL

Personnel Listing of 1950-1951 and 1951-1952 national and local officers, committees, official representatives to other organizations, local representatives. The 1951-1952 listing is complete as of November 15, 1951. For later appointments, see index to 1952 or committee listings in ILLUMINATING ENGINEERING.

A

AAS, C. J.
Local Representative, Faribault, Minn., 1950-1952.

ABRAMOWITZ, A.
Nomenclature Committee, 1950-1952; Local Representative, New York, 1951-1952.

ABERNETHY, JAMES
Local Representative, Port Huron, Mich., 1950-1952.

ACKLAND, ERIC E.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

ADAMS, E. Q.
Nomenclature Committee, 1950-1952.

AGOSTINI, L. G., JR.
Local Representative, Havana, Cuba, 1950-1951.

AIK, EARL H.
Chairman, Milwaukee Section, 1951-1952; Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

AINSWORTH, GEORGE
Historical Committee, 1950-1952; Aviation Lighting Committee, 1950-1951.

AKERMAN, JOSEPH H.
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

AKIN, CLYDE E.
Secretary, Alamo Chapter, 1950-1951.

ALBACH, CARL R.
Local Representative, Santa Fe, New Mexico, 1951-1952.

ALBRACHT, C. E.
Committee on Public Relations and Information, 1951-1952.

ALDEN, WALTER A.
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

ALEXANDER, H. W.
Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

ALLEN, CARL J.
Secretary, Committee on School Lighting, 1950-1952; Sub-Committee on Chalkboards of the Committee on School Lighting, 1950-1951.

ALLEN, G. F.
Sub-Committee on Lighting in Laundries of the Committee on Lighting Study Projects in Industry, 1950-1952.

ALLISON, R. C.
Vice-Chairman, Committee on Store Lighting, 1950-1952.

ALLPHIN, WILLARD
Chairman, Committee on Standards of Quality and Quantity for Interior Illumination, 1950-1952; School Lighting Committee, 1950-1952; Handbook Revision Committee, 1950-1952; Sub-Committee on Bright Conditions in Educational Environments of the Committee on School Lighting, 1950-1951.

ALMRYDE, A. S.
Chairman, Project Committee on Characteristics of Office Materials and Equipment and Related Environmental Factors of the Committee on Office Lighting, 1950-1951; Project Sub-Committee on Recommendations for Specific Areas of the Office Lighting Committee, 1950-1951; Office Lighting Committee, 1950-1952.

AMICK, C. L.
Committee on Lighting Design Practice, 1950-1952.

ANDERSON, A. A.
Sub-Committee on Pavement Surfaces and Safety Lighting of the Committee on Street and Highway Lighting, 1950-1951.

ANDERSON, G. T., JR.
Vice-Chairman, Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

ANDERSON, T. R.
Local Representative, Coulee Dam, Wash., 1950-1951.

ANDREW, CLARENCE P.
Local Representative, Newport News, Va., 1950-1952.

ANGIER, J. F.
Chairman, Sub-Committee on Definitions and Terms of the Aviation Lighting Committee, 1950-1951; Aviation Lighting Committee, 1950-1951; Executive Sub-Committee of the Aviation Lighting Committee, 1950-1951; Sub-Committee on Aviation Lamps of the Aviation Lighting Committee, 1950-1951.

ANGUS, D. L.
Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

ARENBERG, A. L.
Committee on Public Conveyances—Interior Lighting, 1950-1952; Sub-Committee on Marine Lighting of the Committee on Public Conveyances—Interior Lighting, 1951-1952.

ARNER, W. J.
Daylighting Committee, 1950-1952.

ARTHUR, R. A.
Local Representative, Athens, Ga., 1950-1952.

ASHBEE, H. J.
Chairman, British Columbia Section, 1951-1952; Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

ASHE, F. C.
Chairman, Sub-Committee on Lighting Studies of the Aviation Lighting Committee, 1950-1951; Aviation Lighting Committee, 1950-1951; Executive Sub-Committee of the Aviation Lighting Committee, 1950-1951; Sub-Committee on Definitions and Terms and Sub-Committee on Taxiway Lighting of the Aviation Lighting Committee, 1950-1951.

ASHER, JOHN M.
Secretary, Baltimore Chapter, 1950-1952.

ASTOR, FRED G., JR.
Section and Chapter Representative of the Membership Committee, 1951-1952.

ATHERTON, C. A.
Sub-Committee on Editorial Content of the Publications Committee, 1950-1951.

AVERY, B. F.
Secretary, Milwaukee Section, 1950-1952.

B

BACH, L. M. N.
Chairman, Sub-Committee on Artificial Moonlight Project of the Coordinating Committee for Defense, 1951-1952.

BACHMAN, J. P.
Conference Executive Sub-Committee of the Committee on National Technical Conference, 1950-1951.

BAILEY, HARRY T., JR.
Secretary, New Orleans Section, 1950-1952.

BAKEMAN, C. T.
Office Lighting Committee, 1950-1952.

BAKER, A. H.
Daylighting Committee, 1950-1951.

BAKER, CLARK, JR.
Chairman, Mother Lode Chapter, 1951-1952.

BAKER, GERALD M.
Chairman, Alamo Chapter, 1951-1952.

BAKER, STANLEY L.
Section and Chapter Representative of the Membership Committee, 1951-1952.

BALDWIN, M. C.
Local Representative, Winston-Salem, Mass., 1950-1952; Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

BANAHAN, J. O.
Local Representative, Akron, Ohio, 1950-1951.

BANAHAN, L. O.
Chairman, Sub-Committee on Lighting in the Rubber Industry of the Committee on Lighting Study Projects in Industry, 1950-1951.

BANDFIELD, R. E.
Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1951-1952.

BARBER, IRA J.
Local Representative, Fostoria, Ohio, 1950-1952.

BARBROW, L. E.
Co-Chairman, Papers Committee, 1951-1952; Committee on Light Sources, 1950-1952; Official Representative to U. S. National Committee of the International Commission on Illumination, 1950-1952; Committee on Standards of Quality and Quantity for Interior Illumination, 1950-1952; Vice-Chairman, Conference Executive Sub-Committee of the Committee on National Technical Conference, 1950-1951; Task Committee — Joint I.E.S.-A.P.H.A. Committee, 1950-1951.

BARHITE, TUNIS E.
Local Representative, Lockport, N. Y., 1950-1951.

BARKER, F. E.
Section and Chapter Representative of the Membership Committee, 1951-1952.

BARKER, H. L.
Local Representative, Miami Beach, Fla., 1950-1951.

BARNS, E. B.
Special Sub-Committee on Interchange with Foreign Groups of the Committee on Street and Highway Lighting, 1950-1951.

BARNES, JAMES
Local Representative, San Rafael, Calif., 1950-1951.

BARNES, NORMAN H.
Committee on Lighting Service, 1950-1951.

BARNHIZER, W. DEAN
Chairman, Iowa Section, 1950-1951.

BARR, A. C.
Committee on Lighting Maintenance, 1950-1952; Progress Committee, 1951-1952.

BARR, TAYLOR M.
Local Representative, Poughkeepsie, N. Y., 1950-1952; Committee on Farm Lighting, 1951-1952; Committee on Farm Buildings and Work Area Lighting, 1950-1951.

BARRINGTON, EDMUND S.
Secretary, Baltimore Chapter, 1951-1952.

BARRON, CLARENCE B.
Local Representative, Beaumont, Texas, 1950-1952.

BARRY, E. G.
Local Representative, Little Rock, Ark., 1950-1952.

BARTLETT, J. A.
Sub-Committee on Compendium for Signal Lighting of the Aviation Lighting Committee, 1950-1951.

BARTOW, J. B.
Aviation Lighting Committee, 1950-1951.

BARNUM, L. E.
Chairman, Mother Lode Chapter, 1950-1951.

BATEMAN, J. W.
Co-Chairman, Coordinating Committee for Defense, 1951-1952; Member, 1950-1951; Committee on Sports and Recreational Lighting, 1950-1952; Task Committee on Lighting for Civilian Defense, 1950-1951.

BAUMAN, HARVEY
Local Representative, Bluffton, Ohio, 1951-1952.

BAUMGARTNER, G. R.
Committee on Light Control and Equipment Design, 1950-1952; Procedures and Policies Committee, 1951-1952.

BEALS, G. W.
Director, 1951-1952; Procedures and Policies Committee, 1951-1952; Technical Committee Forum, 1951-1952; Industrial Lighting Committee, 1950-1952; Chairman, Medal Award Committee, 1950-1951.

BEGGS, E. W.
Chairman, Committee on Public Conveyances —Interior Lighting, 1950-1952; Chairman, Sub-Committee on Marine Lighting, 1951-1952; Progress Committee, 1950-1952; Committee on Testing Procedures for Illumination Characteristics, 1950-1952; Technical Committee Forum, 1950-1951.

BELL, CHARLES D.
Local Representative, Pueblo, Colorado, 1951-1952.

BEMAN, M. C.
Committee on Lighting and Air Conditioning, 1951-1952.

BEMISTER, R. F.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

BENNING, BERNARD F.
Section and Chapter Representative of the Membership Committee, 1951-1952.

BENSON, EARLE D.
Committee on Sports and Recreational Area Lighting, 1951-1952.

BENSON, B. S., JR.
Committee on Illumination Performance Recommendations, 1950-1952; Committee on Lighting Education, 1950-1952; Committee on Lighting Design Practice, 1950-1952; Committee on Light Control and Equipment Design, 1950-1952; Committee on Sports and Recreational Lighting, 1950-1952; Joint Sub-Committee, I.E.S.-U. S. Public Health Service, 1950-1952; Technical Committee Forum, 1950-1951.

BENTLEY, E. B.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

BERAHA, DENYSE
Residence Lighting Forums Committee, 1950-1951.

BERGH, A. C.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

BERINSTEIN, JULES
Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1951-1952.

BERKA, HOWARD J.
Committee on Light Sources, 1950-1952.

BERRY, CLARENCE J.
Committee on Lighting Service, 1950-1951.

BERRY, E. A.
Local Representative, Canton, Ohio, 1950-1952.

BERWICK, JAMES
Local Representative, Colorado Springs, Colo., 1950-1952.

BETTINGER, M. L.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

BIESELE, R. L., JR.
Director, 1950-1952; Chairman, Daylighting Committee, 1950-1952; Committee on School Lighting, 1950-1952; Committee on Color and Illumination, 1950-1952; Representative A.S.A. Sectional Committee A23, 1950-1952; Professional Requisites Committee, 1950-1951.

BIGELOW, M. H.
Chairman, Northwestern Ohio Chapter, 1951-1952; Progress Committee, 1950-1951.

BIRT, T. W.
Committee on Lighting for Civilian Defense, 1950-1952.

BISCHOFBERGER, F.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

BISER, WILLIAM A.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

BITTERMAN, M. E.
Committee on Standards of Quality and Quantity for Interior Illumination, 1950-1951.

BJORGE, THOMAS A.
Section and Chapter Representative of the Membership Committee, 1951-1952; Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

BLACK, FRANCES
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952; Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

BLACK, LOUIS D.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

BLACKBURN, GEORGE
Local Representative, Rutland, Vt., 1950-1952.

BLACKWELL, H. R.
Committee on Standards of Quality and Quantity for Interior Illumination, 1950-1951.

BLACKSMITH, STANTON M.
Chairman, Northern California Section, 1951-1952.

BLACKWELL, H. R.
Committee on Standards of Quality and Quantity for Interior Illumination, 1951-1952; Coordinating Committee for Defense, 1950-1952; Aviation Lighting Committee, 1950-1951; Sub-Committee on Compendium for Signal Lighting of the Aviation Lighting Committee, 1950-1951; Editorial Board of Sub-Committee on Compendium for Signal Lighting of the Aviation Lighting Committee, 1950-1951.

BLATT, R. C.
Chairman, Aviation Lighting Committee, 1951-1952; Executive Sub-Committee; Chairman, Sub-Committee on Program and Publicity; Sub-Committee on Papers and Sub-Committee on Definitions and Terms of the Aviation Lighting Committee, 1950-1951.

BLAZEK, D. R.
Secretary, Cornhusker Chapter, 1950-1951.

BLETTNER, EDWARD H.
Local Representative, Hanover, Pa., 1950-1952; Section and Chapter Representative of the Membership Committee, 1951-1952.

BLITZER, JACOB
Residence Lighting Forums Committee, 1951-1952.

BLOIS, STANLEY
Local Representative, San Jose, Calif., 1950-1951.

BOAST, WARREN B.
Local Representative, Ames, Iowa, 1950-1952; Committee on School Lighting, 1950-1952; Committee on Lighting Education, 1950-1952; Sub-Committee on Visual Problems of the Committee on School Lighting, 1950-1951.

BOCK, JOHN E.
Committee on Testing Procedures for Illumination Characteristics, 1951-1952; Vice-Chairman, 1950-1951.

BODKIN, W. N.
Committee on Public Conveyances — Interior Lighting, 1950-1952.

BODWELL, RAYMOND G.
Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1951-1952.

BOGARD, GEORGE T.
Committee on Lighting Service, 1950-1951.

BOGEN, S. A.
Committee on Lighting and Air Conditioning, 1950-1952.

BOGHOSIAN, ERNEST
Conference Executive Sub-Committee of the Committee on National Technical Conference, 1950-1951.

BOLLINGER, N. H.
Chairman, Southeast Florida Chapter, 1951-1952.

BOLLONG, J. W. A.
Committee on Street and Highway Lighting, 1950-1951; Sub-Committee on Coordination and Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

BOLTZ, HOWARD A.
Sub-Committee on Lighting in Sheet Metal, Stamping, Folding and Shearing of the Committee on Lighting Study Projects in Industry, 1950-1952.

BOND, CONRAD F.
Chairman, Philadelphia Section, 1950-1951.

BOOKER, JOE L.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

BOOTH, J. J.
Sub-Committee on Lighting in Steel Mills of the Committee on Lighting Study Projects in Industry, 1950-1952.

BOOTH, W. WARREN
Finance Committee, 1951-1952.

BOYD, GLENN G.
Conference Executive Committee of the National Technical Conference Committee, 1951-1952.

BOYD, R. A.
Committee on Daylighting, 1950-1952.

BRADEN, M. G.
Local Representative, Duluth, Minn., 1950-1952.

BRADLEY, R. D.
Chairman, Committee on Light Control and Equipment Design 1950-1952; Committee on Testing Procedures for Illumination Characteristics, 1950-1952; Papers Committee, 1950-1951.

BRADY, CHARLES I.
Committee on Public Conveyances — Interior Lighting, 1950-1951.

BRADY, F. B.
Aviation Lighting Committee, 1950-1951; Sub-Committee on Aircraft Lighting and Sub-Committee on Taxiway Lighting of the Aviation Lighting Committee, 1950-1951.

BRADY, R. R.
Committee on National Technical Conference, 1950-1951; Procedures and Policies Committee, 1950-1951; Committee on Public Relations and Information, 1950-1951; Aviation Lighting Committee, 1950-1951; Executive Sub-Committee of the Aviation Lighting Committee, 1950-1951.

BRAINERD, A. A.
Board of Fellows, 1951-1952; Chairman, Committee on Lighting of Central Station Properties, 1950-1952; Committee on Standards of Quality and Quantity for Interior Illumination, 1950-1952; Lighting Maintenance Committee, 1951-1952; Committee on Lighting of Central Station Properties, 1951-1952; Committee on Color and Illumination, 1950-1952; Representative to U. S. National Committee of the International Commission on Illumination, 1950-1951.

BRANNAN, JAMES N.
Section and Chapter Representative of the Membership Committee, 1951-1952.

BRANT, E. B.
Section and Chapter Representative of the Membership Committee, 1951-1952.

BRAUN, EUGENE
Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

BRECKENRIDGE, F. C.
Aviation Lighting Committee, 1950-1951; Executive Sub-Committee of the Aviation Lighting Committee, 1950-1951; Chairman, Sub-Committee on Compendium for Signal Lighting of the Aviation Lighting Committee, 1950-1951; Chairman, Editorial Board of Sub-Committee on Compendium for Signal Lighting, 1950-1951.

BREDAHL, A. C.
Official Representative to the Industry Committee in Connection with the Revision of "Handbook of Interior Wiring Design," 1950-1952.

BRIGGS, C. W.
Sub-Committee on Lighting in Foundries of the Committee on Lighting Study Projects in Industry, 1950-1952.

BRIGHT, GRAHAM
Committee on Mine Lighting, 1950-1951.

BRIT, T. W.
Chairman, Winnipeg Chapter, 1951-1952.

BROCARD, T. S.
Joint Sub-Committee I.E.S.-U.S. Public Health Service, 1950-1952.

BROMBERG, ROBERT
Nomenclature Committee, 1951-1952.

BRONSON, WALTER
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

BROTZMAN, R. P.
Committee on Street and Highway Lighting, 1950-1952; Special Sub-Committee on Standard Practice and Special Sub-Committee on Interchange with Foreign Groups of the Committee on Street and Highway Lighting, 1950-1951.

BROWDER, J. B.
Regional Vice-President, 1950-1951; Committee on Local Activities, 1950-1951; Professional Requisites Committee, 1950-1951; Committee on Street and Highway Lighting, 1950-1951; Sub-Committee on Public Lighting and Traffic Safety of the Committee on Street and Highway Lighting, 1950-1951.

BROWN, CLINTON V.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

BROWN, F. E.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

BROWN, KERMIT R.
Local Representative, Casper, Wyoming, 1951-1952.

BROWN, L. H.
Committee on School Lighting, 1950-1952; Committee on Color and Illumination, 1950-1952; Sub-Committee on Lighting in the Canning Industry of the Committee on Lighting Study Projects in Industry, 1950-1952; Official Representative to Inter-Society Color Council, 1950-1952; Daylighting Committee, 1950-1951; Task Committee on Conference with the National Council for School House Construction, 1950-1951.

BROWN, R. B., JR.
Committee on Lighting for Civil Defense, 1950-1952.

BROWN, ROBERT W.
Chairman, Ohio Valley Section, 1950-1951.

BROWN, W. C.
Chairman, Industrial Lighting Committee, 1950-1952; Representative, U. S. National Committee of the International Commission on Illumination, 1950-1952; Official Representative to the A.S.A. Sub-Committee, A11, 1950-1952; Medal Awards Committee, 1950-1951; Committee on National Technical Conference, 1950-1951.

BRYAN, WENDELL
Sub-Committee on Student Vision and Scholarship of the Committee on School Lighting, 1950-1951.

BUCHANAN, C. W.
Local Representative, Regina, Sask., 1950-1952.

BUCHER, R. S.
Committee on Lighting of Central Station Properties, 1950-1952; Committee on Street and Highway Lighting, 1950-1952; Sub-Committtee on Program and Publicity of the Committee on Street and Highway Lighting, 1950-1951

BUCHHOLTZ, EDITH
Chairman, Sub-Committee on Home Lighting Data Sheets of the Publications Committee, 1950-1952; Committee on Farm Lighting, 1951-1952; Committee on Farm Buildings and Work Area Lighting, 1950-1951.

BUCK, G. B., II
Chairman, Rocky Mountain Section, 1951-1952.

BUCK, G. B., JR.
Sub-Committee on Student Vision and Scholarship of the Committee on School Lighting, 1950-1951.

BUCKNER, LAURENCE O.
Local Representative, York, Pa., 1950-1952.

BULL, H. S.
Daylighting Committee, 1950-1952.

BURLESON, RANDALL L.
Secretary, Indiana Chapter, 1950-1952.

BURNHAM, ROBERT D.
Sub-Committee on Lighting in Kitchens, Lunchrooms, Cafeterias and Dining Areas of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1951.

BURNHAM, S. L.
Secretary, Arizona Chapter, 1951-1952.

BURNS, J. J.
Section and Chapter Representative of the Membership Committee, 1951-1952.

BURTON, R. B., SR.
Historical Committee, 1951-1952.

BUTLER, G. R.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

BUTLER, THOMAS W.
Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

BUTTS, JOHN T.
Local Representative, Franklin, Ky., 1950-1951.

BUTTS, R. W.
Committee on National Technical Conference, 1950-1951.

BYARS, BRUCE
Local Representative, Wilson Dam, Ala., 1950-1951.

C

CAHILL, L. J.
Joint Sub-Committee I.E.S. - U. S. Public Health Service of the Committee on Lighting Education, 1951-1952.

CALDWELL, F. C.
Local Representative, Columbus, Ohio, 1950-1951.

CALLENDER, JACK O.
Local Representative, Springfield, Mass., 1950-1952.

CALLIS, D. A.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951; Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

CANNON, CECIL L.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

CANTRELL, W. T.
Local Representative, Macon, Ga., 1951-1952.

CARBAJAL, ANTONIO
Secretary, Mexico Chapter, 1951-1952.

CARLSON, F. E.
Committee on Lighting for Television Production, 1951-1952; Representative A.S.A. Committee Z58, 1950-1951.

CARNEY, HAYDEN E.
Committee on Sports and Recreational Lighting, 1950-1952; Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952; Chairman, Northwestern Ohio Chapter, 1950-1951.

CARROLL, HUGH
Vice-Chairman, Progress Committee, 1951-1952; Member, 1950-1951; Committee on Lighting of Central Station Properties, 1951-1952.

CARSON, J. B.
Local Representative, Kingsport, Tenn., 1951-1952.

CARTER, DONALD T.
Committee on Sports and Recreational Area Lighting, 1951-1952; Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

CARTER, F. M.
Committee on Street and Highway Lighting, 1950-1952; Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

CAUDILL, W. W.
Daylighting Committee, 1951-1952.

CARTER, T. E.
Local Representative, West Palm Beach, Fla., 1950-1951.

CAVERLY, D. P.
Chairman, Committee on Store Lighting, 1950-1952; Committee on Lighting Service, 1950-1951.

CHADEAYNE, WILBUR D.
Local Representative, Bangor, Maine, 1950-1952.

CHAFFIN, LEO E.
Section and Chapter Representative of the Membership Committee, 1951-1952.

CHAMBERS, J. R.
Secretary, Chicago Section, 1951-1952; Committee on Lighting Study Projects in Industry, 1950-1952; Sub-Committee on Lighting in Laundries of the Committee on Lighting Study Projects in Industry, 1950-1952; Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

CHAPPAT, JEAN JACQUES
Committee on Progress, 1950-1951.

CHARBONNET, DANIEL D. R.
Local Representative, Jackson, Miss., 1950-1951.

CHASSAING, BROOKS
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

CHENEY, RALPH
Committee on Constitution and By-Laws, 1950-1951.

CHORLTON, J. M.
Chairman, Committee on School Lighting, 1951-1952; Member, 1950-1951; Representative to A.S.A. Sub-Committee A23, 1951-1952; Chairman, Sub-Committee on Chalkboards of the Committee on School Lighting, 1950-1951; Sub-Committee on Visual Problems of the Committee on School Lighting, 1950-1951; Sub-Committee on Brightness Conditions in Educational Environments of the Committee on School Lighting, 1950-1951.

CHRISTENSEN, A. L.
Sub-Committee on Lighting in Laundries of the Committee on Lighting Study Projects in Industry, 1950-1952.

CHRISTENSEN, C. O.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952; Local Representative, Dubuque, Iowa, 1950-1951.

CHURCH, ERIC H.
Chairman, Lighting Maintenance Committee, 1951-1952; Vice-Chairman, 1950-1951; Publications Committee, 1950-1952; Chairman, Sub-Committee on Technical Data Sheets of the Publications Committee, 1951-1952; Committee on Testing Procedures for Illumination Characteristics, 1950-1952; Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

CLARE, TIMOTHY J.
Local Representative, New Britain, Conn., 1950-1952.

CLARKE, A. H.
Chairman, Committee on Sports and Recreational Area Lighting, 1951-1952; Vice-Chairman, 1950-1951; Chairman, Central New York Chapter, 1950-1951; Aviation Lighting Committee, 1950-1951; Sub-Committee on Airport Lighting of the Aviation Lighting Committee, 1950-1951.

CLARK, FRANCIS
Secretary, Connecticut Section, 1950-1951.

CLARK, GEORGE
Committee on Lighting for Television Production, 1951-1952; Committee on National Technical Conference, 1950-1952; Chairman, Conference Executive Sub-Committee of the Committee on National Technical Conference, 1950-1951; Chairman, Capital Section, 1950-1951.

CLAUER, LEROY W.
Local Representative, Marion, Ohio., 1950-1952.

CLAYTON, GEORGE
Joint Sub-Committee I.E.S. - U. S. Public Health Service of the Committee on Lighting Education, 1950-1952.

CLEARY, LEO H.
Conference Executive Sub-Committee of the Committee on National Technical Conference, 1950-1951.

CLEAVER, O. P.
Progress Committee, 1950-1952; Coordinating Committee for Defense, 1950-1952; Research Committee, 1950-1951; Sub-Committee on Editorial Content of the Publications Committee, 1950-1951.

CLEMENT, G. K.
Aviation Lighting Committee, 1950-1951.

CLERKE, P. N.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

CLUCAS, J. R.
Section and Chapter Representative of the Membership Committee, 1951-1952.

COAKLEY, ROSE
Secretary, Northwestern Ohio Chapter, 1950-1952.

COCHRAN, GORDON G.
Local Representative, Olympia, Wash., 1950-1951.

COGGERSHALL, E. J.
Committee on Mine Lighting, 1950-1952.

COGGINS, D. I.
Aviation Lighting Committee, 1950-1951.

COGHLAN, T. F.
Progress Committee, 1950-1952.

COHN, SOL
Chairman, Northern California Section, 1950-1951.

COLE, EDWARD R.
Secretary, Connecticut Section, 1951-1952.

COLE, MAX
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

COLEMAN, E. E.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

COLEY, FRANK A.
Local Representative, Jamestown, N. Y., 1950-1951.

COLLIER, A. L.
Sub-Committee on Lighting in Foundries of the Committee on Lighting Study Projects in Industry, 1950-1952.

COLLINS, W. A.
Sub-Committee on Aircraft Lighting of the Aviation Lighting Committee, 1950-1951.

COMMERY, E. W.
Chairman, Committee on Lighting for Television Viewing, 1951-1952; Representative to Inter-Society Color Council, 1950-1952; Committee on Color and Illumination, 1950-1952; Chairman, Committee on Television Lighting, 1950-1951.

CONGDON, GEORGE E.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1952.

CONHEADY, ROYAL M.
Section and Chapter Representative of the Membership Committee, 1951-1952.

CONNELL, HOWARD B.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

CONNELL, T. J.
Local Representative, Coral Gables, Fla., 1950-1951.

CONNOR, J. C.
Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

CONOVER, EDMUND W.
Daylighting Committee, 1950-1952.

COOK, H. A.
Committee on Lighting of Central Station Properties, 1950-1952.

COOK, MAURICE
Committee on Lighting and Air Conditioning, 1950-1951.

COOKE, L. S.
Sub-Committee on Lighting in the Textile Industry of the Committee on Lighting Study Projects in Industry, 1950-1952.

COONS, ROBERT D.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1952.

COOPER, BERLON C.
Committee on Public Relations and Information, 1951-1952; Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952; Chairman, Task Committee to Study Possible Change in I.E.S. Fiscal Year, 1950-1952; Professional Requisites Committee, 1950-1951; Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

COPLAND, E. J.
Section and Chapter Representative of the Membership Committee, 1951-1952.

COREY, HAMILTON
Local Representative, Charlotte, N. C., 1951-1952.

CORRIGAN, CHARLES E.
Section and Chapter Representative of the Membership Committee, 1951-1952.

CORWIN, R. W.
Chairman, Committee on Lighting of Central Station Properties, 1951-1952; Member, 1950-1951 .

COTTRELL, CASPER L.
Chairman, Central New York Section, 1951-1952; Secretary, 1950-1951; Nomenclature Committee, 1950-1952; Handbook Revision Committee, 1950-1952; Committee on Color and Illumination, 1950-1952.

COUSINS, GEORGE G.
Historical Committee, 1950-1951.

COVINGTON, FLOYD A.
Regional Vice-Presdient, 1950-1951; Committee on Local Activities, 1950-1952.

COX, JAMES L.
Committee on Progress, 1950-1952; Committee on Light Sources, 1950-1952.

COXHEAD, S.
Local Representative, Rockford, Ill., 1950-1952.

CRAMER, H. A.
Sub-Committee on Aircraft Lighting of the Aviation Lighting Committee, 1950-1951.

CRAVATH, J. R.
Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

CREVASSE, J. N.
Local Representative, Mandarin, Fla., 1951-1952; Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

CRITES, W. D.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

CRITTENDEN, E. C.
Medal Award Committee, 1951-1952.

CROCKETT, RALPH E.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

CROCKETT, W. R.
Secretary, Mississippi Chapter, 1950-1951; Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

CROMER, JOHN W.
Local Representative, Butte, Mont., 1950-1951.

CROSEE, W. L., JR.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

CROTSER, LLOYD W.
Regional Chairman, Committee on Membership, 1950-1952; Section and Chapter Representative of the Membership Committee, 1950-1951.

CROUCH, C. L.
Advisory Board on Committee Personnel, 1950-1952; *Armed Services NRC Vision Committee, 1950-1952; Coordinating Committee for Defense, 1950-1952; Member Ex-officio, A.S.A. Committees, 1950-1952 Representative, U. S. National Committee of the International Commission on Illumination, 1951-1952; Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951; Sub-Committee on Compendium for Signal Lighting and Editorial Board of Sub-Committee on Compendium for Signal Lighting of the Aviation Lighting Committee, 1950-1951; Task Committee—Joint I.E.S.-A.P.H.A. Committee, 1950-1951; Task Committee on Conference with the National Council for School House Construction, 1950-1951.

CRYSLER, C. M.
Committee on Mine Lighting, 1950-1952; Sub-Committee on Lighting Study Project in Steel Mills of the Committee on Lighting Study Projects in Industry, 1950-1952.

CULP, JAMES L.
Local Representative, Ann Arbor, Mich., 1950-1952.

CULP, WAYNE J.
Section and Chapter Representative of the Membership Committee, 1951-1952.

CUTLER, C. M.
Committee on Color and Illumination, 1950-1952; Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952; Chairman, 1950-1951.

D

DAHLIN, R. E.
Aviation Lighting Committee, 1950-1951; Sub-Committee on Papers of the Aviation Lighting Committee, 1950-1951.

DAILEY, A. E.
Local Representative, Richmond, Ind., 1950-1952.

DAMM, HENRY J.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

DANCE, WALTER H.
Local Representative, Ft. Lauderdale, Fla., 1951-1952.

D'ANDRADE, H. E.
Committee on Lighting of Central Station Properties, 1951-1952.

DARLEY, WILLIAM G.
Local Representative, Austin, Texas, 1950-1952; School Lighting Committee, 1950-1952.

DATES, H. B.
Historical Committee, 1950-1952.

DAVIDSON, H. F.
Committee on Light Sources, 1950-1952; Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952; Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951; Sub-Committee on Chalkboards of the School Lighting Committee, 1950-1951; Local Representative, Lima, Ohio, 1950-1951.

DAVIS, L. R.
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

DAVIS, J. MITCHELL
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

DAWSON, JOHN E.
Secretary, Michigan Section, 1951-1952.

DEAN, G. F.
Vice-Chairman, Office Lighting Committee, 1950-1952; Committee on Color and Illumination, 1950-1952; Sub-Committee on Supplementary Lighting of the Committee on Lighting Study Projects in Industry, 1950-1952; Regional Vice-President, 1950-1951; Committee on Local Activities, 1950-1951; Sub-Committee on Editorial Content of the Publications Committee, 1950-1951; Chairman, Project Sub-Committee on Recommendations for Specific Areas of the Office Lighting Committee, 1950-1951.

DEAN, J. H.
Committee on Lighting Design Practice, 1950-1952.

DeCEW, RICHARD E.
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

DEITRICK, IRA G.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

DE LA ROSA, J. C.
Committee on Public Conveyances — Interior Lighting, 1950-1952.

D'ESOPO, F. P.
Sub-Committee on Home Lighting Data Sheets of the Publications Committee, 1950-1951.

DeLONG, BEATTIE M.
Section and Chapter Representative of the Membership Committee, 1951-1952.

DENNIS, R. L.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1952.

DETTMAN, L. W.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

DeWINTER, J. A.
Secretary, Western Michigan Chapter, 1951-1952.

DICKERHOFF, J. F.
Local Representative, Mineola, N. Y., 1950-1952.

DICKSON, JOHN S.
Sub-Committee on Lighting in the Textile Industry of the Committee on Lighting Study Projects in Industry, 1950-1952.

DICKSON, RUSSELL J.
Local Representative, Cincinnati, Ohio, 1950-1951.

DIGGS, E. T.
Sub-Committee of Lighting Advisors for the East Coast of the Committee on Lighting for Civil Defense, 1951-1952.

DITCHMAN, J. P.
Committee on Farm Lighting, 1951-1952; Committee on Farm Buildings and Work Area Lighting, 1950-1951.

DOBBIN, ROSS L.
Local Representative, Peterborough, Ont., 1950-1952.

DODDS, MARY E.
Committee on Lighting for Television Viewing, 1951-1952; Residence Lighting Forums Committee, 1950-1952; Residence Lighting Committee, 1950-1952; Committee on Television Lighting, 1950-1951; Sub-Committee on Home Lighting Data Sheets of the Publications Committee, 1950-1951.

DODINGTON, E. L.
Committee on Lighting Education, 1950-1952; Aviation Lighting Committee, 1950-1951.

DOHERTY, T. H.
Section and Chapter Representative of the Membership Committee, 1951-1952; Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

DOLKART, LEO
Historical Committee, 1950-1952.

DOMONEY, EARL R.
Local Representative, Saginaw, Mich., 1950-1952; Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1951-1952.

DONER, CRESTON
Committee on Lighting and Architecture, 1950-1952; Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951; Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

DORSEY, R. T.
Committee on Sports and Recreational Lighting, 1950-1952; Committee on Protective Lighting, 1951-1952; Chairman, Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1951-1952.

DORVAL, OSCAR
Secretary, Quebec Chapter, 1951-1952.

DOUGLAS, DAVID J., JR.
Local Representative, Asbury Park, N. J., 1950-1952.

DOWNES, ARTHUR C.
Committee on Light Sources, 1950-1952.

DREBICK, FRANK M.
Local Representative, Winslow, Wash., 1950-1951.

DRESSOR, CHARLES G.
Local Representative, Greeley, Colo., 1950-1952.

DROGE, H.
Sub-Committee on Aircraft Lighting of the Aviation Lighting Committee, 1950-1951.

DRUMM, S. L.
Coordinating Committee for Defense, 1950-1952; Sub-Committee of Lighting Advisors for the East Coast of the Committee on Lighting for Civil Defense, 1951-1952.

DuCHENE, ANDREW H.
Local Representative, Sherbrooke, Que., Can., 1950-1952.

DUFFY, ELMORE J.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1952.

DUMMEL, R. G.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

DUTTER, H. J., JR.
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

DWINELL, C. I.
Residence Lighting Forums Committee, 1950-1951.

DZWONCZYK, V. L.
Committee on Lighting of Central Station Properties, 1950-1952.

E

EARLY, DOYT
Committee on Daylighting, 1950-1952.

EASTMAN, ARTHUR
Committee on Mine Lighting, 1950-1952; Sub-Committee on Visual Problems of the Committee on School Lighting, 1950-1951.

ECCLESTONE, JOHN S.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

ECKERT, HAROLD
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

EDDY, LILLIAN E.
Residence Lighting Forums Committee, 1950-1952; Sub-Committee on Home Lighting Data Sheets of the Publications Committee, 1950-1951.

EDMAN, W. H.
Special Sub-Committee on Standard Practice of the Committee on Street and Highway Lighting, 1950-1951.

EDWARDS, EARLE C.
Local Representative, Binghamton, N. Y., 1950-1951; Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

EGELER, C. E.
Committee on Lighting of Central Station Properties, 1950-1952; Committee on Lighting Study Projects in Industry, 1950-1952; Sub-Committee on Lighting in Foundries of the Committee on Lighting Study Projects in Industry, 1950-1952; Sub-Committee on Marine Lighting of the Committee on Public Conveyances—Interior Lighting, 1951-1952; Representative A.S.A. Committee Z55, 1950-1951.

ELWARD, JOSEPH F.
Local Representative, Montgomery, Ala., 1950-1951.

EMDEN, NORMAN
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

EMES, THOMAS
Local Representative, Trail, B. C., 1950-1951.

ENDRES, L. M.
Office Lighting Committee, 1950-1952.

ENGLE, CLAUDE R.
Secretary, Capital Section, 1951-1952.

ENGLE, W. J.
Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

ENLIND, C. J.
Sub-Committee on Lighting in Steel Mills of the Committee on Lighting Study Projects in Industry, 1950-1952.

ERICKSON, GEORGE
Local Representative, Eureka, Calif., 1950-1951.

ESHELBY, ROY A.
Professional Requisites Committee, 1950-1951; Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

ESTABROOK, CARL G.
Secretary, Capital Section, 1950-1951; Conference Executive Sub-Committee of the Committee on National Technical Conference, 1950-1951.

ESTLER, GEORGE L.
Local Representative, Morristown, N. J., 1950-1952.

EVANS, A. W.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

EVANS, GEORGE S.
Vice-Chairman, Light Sources Committee, 1951-1952; Member, 1950-1951; General Board of Examiners, 1951-1952; Procedures and Policies Committee, 1951-1952.

EVANS, RALPH
Chairman, Committee on Color and Illumination, 1950-1952.

EVERITT, R. S.
Local Representative, Independence, Mo., 1950-1952.

EVERY, DAVID F.
Local Representative, Napanee, Ont., 1950-1950-1952.

F

FAGIN, IRVING
Aviation Lighting Committee, 1950-1951.

FAHEY, E. M.
Chairman, General Board of Examiners, 1950-1952.

FAHEY, J. H.
Committee on Street and Highway Lighting, 1950-1952; Sub-Committee on Program and Publicity and Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

FAHEY, LESTER S.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

FAHSBENDER, MYRTLE
Residence Lighting Forums Committee, 1950-1952; Residence Lighting Committee, 1950-1952; Committee on Lighting for Television Viewing, 1951-1952; Director, 1950-1951; Committee on Testing Procedures for Illumination Characteristics, 1950-1951.

FALGE, R. N.
Official Representative to National Committee on Uniform Traffic Laws and Ordinances, 1950-1952; Representative A.S.A. Committee D7, 1950-1952.

FALL, WILLIAM
Committee on Public Conveyances — Interior Lighting, 1950-1951.

FARBER, VICTOR O.
Section and Chapter Representative of the Membership Committee, 1951-1952.

FARGIS, E. A.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1952.

FARNHAM, R. E.
Representative, A.S.A. Committees Z22 and Z38, 1950-1952.

FARNSWORTH, DEAN
Committee on Color and Illumination, 1950-1952; Representative to Inter-Society Color Council, 1950-1952.

FAVRO, ELMER
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

FAY, WINIFRED L.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

FEAGANS, F. I.
Secretary, Heart of America Section, 1950-1952.

FEDER, J. B.
Sub-Committee on Marine Lighting of the Committee on Public Conveyances — Interior Lighting, 1951-1952.

FEINBERG, RICHARD
Local Representative, Forest Grove, Ore., 1950-1951.

FELDKAMP, GEORGE
Local Representative, Peoria, Ill., 1950-1952.

FETZER, STELLA
Sub-Committee on Home Lighting Data Sheets of the Publications Committee, 1950-1951.

FEUILLAN, WILLIAM
Residence Lighting Committee, 1951-1952.

FIELD, B.
Secretary, Hamilton, Ontario Chapter, 1951-1952; Committee on Public Relations and Information, 1950-1951.

FIFER, THOMAS J.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

FINCH, D. M.
Chairman, Nomenclature Committee, 1951-1952; Committee on Testing Procedures for Illumination Characteristics, 1950-1952; Committee on Street and Highway Lighting, 1950-1952; Sub-Committee on Research of the Committee on Street and Highway Lighting, 1950-1951.

FINISON, HARVEY J.
Advisory Group from National Restaurant Association of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

FINN, R. C.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

FINNEY, COLLIN
Local Representative, Nashville, Tenn., 1951-1952; Section and Chapter Representative of the Membership Committee, 1951-1952.

FISHER, W. C.
Sub-Committee on Aircraft Lighting of the Aviation Lighting Committee, 1950-1951.

FITCH, FRANCIS W.
Local Representative, Cheyenne, Wyo., 1950-1951.

FLETCHER, ELLSWORTH R.
Chairman, Oregon Section, 1951-1952.

FLETCHER, GEORGE C.
Local Representative, Des Moines, Iowa, 1950-1952; Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1952.

FLETCHER, PERCY F.
Local Representative, Victoria, B. C., 1950-1951.

FODELL, ANTHONY
Sub-Committee on Home Lighting Data Sheets of the Publications Committee, 1950-1951.

FOLCKER, IVAR
Committee on Progress, 1950-1951.

FOLEY, J. R.
Local Representative, Kansas City, Kans., 1950-1952.

FOLSOM, W. E.
Vice-President, Southwestern Region, 1951-1952; Committee on Local Activities, 1951-1952; Daylighting Committee, 1950-1952; Industrial Lighting Committee, 1950-1952; Office Lighting Committee, 1950-1952; Sustaining Membership Committee, 1950-1951; Sub-Committee on Brightness Conditions in Educational Environments of the Committee on School Lighting, 1950-1951.

FORBES, J. C.
Chairman, Sub-Committee of Lighting Advisors for the East Coast of the Committee on Lighting for Civil Defense, 1951-1952; Committee on National Technical Conference, 1950-1952; Committee on Lighting Service, 1950-1951; Committee on Protective Lighting, 1950-1951.

FOSS, CARL E.
Committee on Color and Illumination, 1950-1952.

FOULKS, W. V. C.
Committee on Constitution and By-Laws, 1950-1952; Technical Committee Forum, 1950-1952; Committee on School Lighting 1950-1952; Task Committee on Conference with the National Council for School House Construction, 1950-1951.

FOURAKER, L. L.
Local Representative, College Station, Texas, 1950-1952.

FOWLE, A. W.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

FOWLER, E. W.
Chairman, Committee on Lighting Study Projects in Industry, 1950-1951; Technical Committee Forum, 1950-1951; Committee on Lighting Maintenance, 1950-1951; Representative A.S.A. Committee Z55, 1950-1951.

FOWLER, G. C.
Office Lighting Committee, 1950-1952; Chairman, Project Sub-Committee on Performance of Lighting Systems of the Committee on Office Lighting, 1950-1951; Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

FOX, ALBERT A.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

FRANCK, KURT
Committee on Light Control and Equipment Design, 1950-1952; Progress Committee, 1950-1952; Committee on Testing Procedures for Illumination Characteristics, 1950-1952; Local Representative, Newark, Ohio, 1950-1952.

FRASE, E. L.
Sub-Committee on Lighting in Sheet Metal, Stamping, Folding and Shearing of the Committee on Lighting Study Projects in Industry, 1950-1952.

FRATUS, JOHN V., JR.
Local Representative, Essex, Conn., 1950-1952.

FREDERICK, G. WILLIAM
Local Representative, Sioux Falls, S. D., 1951-1952.

FREEMAN, D. C.
Chairman, Committee on Lighting Maintenance, 1950-1951.

FREMAUX, EMMETT
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

FREY, PAUL A.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

FRIEND, W. L.
Secretary, Southern California Section, 1951-1952.

FROST, DON
Local Representative, Calgary, Alb., 1950-1951.

FRY, GLENN A.
Committee on Standards of Quality and Quantity for Interior Illumination, 1950-1952; Task Committee—Joint I.E.S.-A.P.H.A. Committee, 1950-1951.

FUCHS, THEODORE
Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

FUGELSANG, NELS
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

FULLER, D. WILLIAM
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

FULTON, C. K.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

FUNK, PAUL V.
Sub-Committee on Lighting in Auditoriums and Churches of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1951-1952.

G

GAER, GLEN B.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

GAGE, FRANK
Local Representative, Walla Walla, Wash., 1950-1951.

GAGE, H. P.
Nomenclature Committee, 1950-1952.

GALARNEAU, J. G.
Chairman, Oregon Section, 1950-1951.

GALE, MARY LOVE
Residence Lighting Forums Committee, 1951-1952.

GARRETT, WALTER H., JR.
Section and Chapter Representative of the Membership Committee, 1951-1952.

GASKEL, GEORGE
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

GAUGLER, JOHN R.
Local Representative, Lafayette, La., 1950-1952.

GAVITT, H. A.
Local Representative, Fremont, Ohio, 1950-1952.

GEARY, E. A.
Sub-Committee on Marine Lighting of the Committee on Public Conveyances — Interior Lighting, 1951-1952.

GEHAN, J. C.
Local Representative, Waterloo, Iowa, 1950-1952.

GIBB, R. W.
Secretary, Cornhusker Chapter, 1951-1952.

GIBSON, MRS. A. L.
Conference Executive Sub-Committee of the Committee on National Technical Conference, 1950-1951.

GIBSON, C. D.
Daylighting Committee, 1950-1952.

GIBSON, K. S.
Nomenclature Committee, 1950-1952; Alternate Representative to the American Association for the Advancement of Science, Governing Board, 1950-1952.

GILBERT, MARCUS S.
Chairman, Indiana Chapter, 1951-1952; Committee on Testing Procedures for Illumination Characteristics, 1950-1952.

GILCHRIST, JOHN W.
Local Representative, Memphis, Tenn., 1950-1952.

GILLEARD, GEORGE
Sub-Committee on Lighting in Kitchens, Lunchrooms, Cafeterias and Dining Areas of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

GLASS, G. K.
Secretary, Committee on Street and Highway Lighting, 1951-1952; Member, 1950-1951; Executive Sub-Committee on Street and Highway Lighting, 1950-1952; Chairman, Sub-Committee on Public Lighting and Traffic Safety and Chairman, Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951; Special Sub-Committee on I.E.S. Lighting Handbook of the Committee on Street and Highway Lighting, 1950-1951.

GLEIM, E. J.
Committee on Mine Lighting, 1951-1952.

GLICK, FRANCIS P.
Local Representative Allentown, Pa., 1950-1952.

GOBLE, L. E.
Sub-Committee on Supplementary Lighting of the Committee on Lighting Study Projects in Industry, 1950-1952.

GOCHENAUER, FORD M.
Local Representative, Lancaster, Pa., 1950-1952.

GODDARD, C. H.
Past President, 1950-1952; Board of Nominations, 1950-1952; Chairman, Trustees, I.E.S. Retirement Pension Fund, 1951-1952; Medal Award Committee, 1950-1952; Advisory Board on Committee Personnel, 1950-1952; Procedures and Policies Committee, 1950-1952; Engineers Joint Council, Explanatory Conference, 1950-1951; Representative to U. S. National Committee of the International Commission on Illumination, 1950-1951.

GOLD, LOUIS
Sub-Committee on Lighting in Auditoriums and Churches of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

GOOD, EDWARD J.
Local Representative, Louisville, Ky., 1950-1951.

GOODALL, KATHARINE T.
Committee on Lighting Service, 1950-1951.

GOODELL, PAUL H.
Board of Fellows, 1950-1952.

GOODMAN, R. H.
Committee on Sports and Recreational Area Lighting, 1950-1952; Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

GORDON, WALTER S., JR.
Chairman, Sub-Committee on Lighting for the Woodworking Industry of the Committee on Lighting Study Projects in Industry, 1950-1951.

GRAFF, W. F.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

GRAHAM, R. C.
Committee on Public Relations and Information, 1950-1951.

GRAM, S. R.
Local Representative, Eau Claire, Wis., 1950-1952.

GRANNIS, C. O.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

GRANVILLE, WALTER C.
Committee on Color and Illumination, 1950-1952; Project Committee on Characteristics of Office Materials and Equipment and Related Environmental Factors of the Committee on Office Lighting, 1950-1951.

GRATTAN, HARRY
Vice-Chairman, Committee on Lighting for Civil Defense, 1951-1952; Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952; Conference Executive Sub-Committee of the Committee on National Technical Conference, 1950-1951; Committee on Light Sources, 1950-1951; Task Committee on Lighting for Civilian Defense, 1950-1951.

GRAVES, L. H.
Chairman, Historical Committee, 1951-1952; Member, 1950-1951; Task Committee on Advance Planning, 1950-1952; Committee on Lighting of Central Station Properties, 1950-1952; Task Committee to Study Possible Change in I.E.S. Fiscal Year, 1950-1951.

GRAY, S. McK.
Committee on Testing Procedures for Illumination Characteristics, 1950-1952.

GREENBURG, LEONARD
Committee on Standards of Quality and Quantity for Interior Illumination, 1950-1952.

GREEN, DONALD P.
Secretary, Twin City Section, 1951-1952.

GREEN, H. H.
Committee on Publications and Information, 1950-1952.

GREEN, R. N.
Chairman, Cleveland Section, 1951-1952.

GREENE, B. F.
Progress Committee, 1950-1952; Committee on Light Sources, 1950-1952; Committee on Testing Procedures for Illumination Characteristics, 1950-1952; Official Representative to the A.S.A. Sectional Committee A9, 1950-1952; Daylighting Committee, 1950-1952.

GREGORY, F. S.
Local Representative, Alice, Texas, 1950-1952.

GREPPIN, E. H.
Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

GRIEB, EDWARD H.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

GRIFFIN, N. L.
Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

GROBEN, JOHN S.
Local Representative, Evansville, Ind., 1950-1951.

GROSH, HOWARD
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

GUESS, B. L.
Local Representative, Corpus Christi, Texas, 1950-1952.

GUILFORD, J. P.
Committee on Color and Illumination, 1950-1952.

GUILLORY, MASON
Sub-Committee on Artificial Moonlight Project of the Coordinating Committee for Defense, 1951-1952.

GUILLOT, E. C., JR.
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

GUINEY, HORACE L.
Conference Executive Sub-Committee of the Committee on National Technical Conference, 1950-1951.

GURIN, H. M.
Committee on Lighting for Television Production, 1951-1952.

GUSTAT, JOSEPH L.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

GUTH, S. K.
Committee on School Lighting, 1950-1952; Nomenclature Committee, 1950-1952; Committee on Lighting Education, 1950-1952; Committee on Illumination Performance Recommendations, 1950-1952; Committee on Standards of Quality and Quantity for Interior Illumination, 1950-1952; Representative to the A.A.A.S. Governing Board, 1950-1952; Chairman, Sub-Committee on Student Vision and Scholarship of the Committee on School Lighting, 1950-1951; Research Committee, 1950-1951.

H

HADLEY, CECIL
Chairman, Indiana Chapter, 1950-1951.

HALL, J. D.
Committee on Mine Lighting, 1950-1952; Sub-Committee on Aircraft Lighting and Sub-Committee on Aviation Lamps of the Aviation Lighting Committee, 1950-1951.

HALL, R. M.
Sub-Committee on Student Vision and Scholarship of the Committee on School Lighting, 1950-1951.

HALLMAN, E. B.
Committee on Public Conveyances — Interior Lighting, 1950-1952; Sub-Committee on Aircraft Lighting of the Aviation Lighting Committee, 1950-1951.

HALLMAN, FRANK R.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

HALSEY, THOMAS R.
Chairman, Alamo Chapter 1950-1951.

HALTEMAN, E. W.
Local Representative, Bethlehem, Pa., 1950-1952 Residence Lighting Committee, 1950-1952; Secretary, Eastern Pennsylvania Chapter, 1950-1951.

HALVORSON, C. A. B.
Committee on Street and Highway Lighting, 1950-1952; Executive Sub-Committee on Street and Highway Lighting, 1950-1951; Sub-Committee on Pavement Surfaces and Safety Lighting of the Committee on Street and Highway Lighting, 1950-1951.

HAM, CLIFFORD
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

HAMEL, J. S.
Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

HAMILTON, ROBERT H.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

HAMMAN, GRACE C.
Sub-Committee on Visual Problems of the Committee on School Lighting, 1950-1951.

HAMON, R. L.
Sub-Committee on Student Vision and Scholarship of the Committee on School Lighting, 1950-1951; Sub-Committee on Visual Problems of the Committee on School Lighting, 1950-1951.

HAMPTON, J. DALE
Local Representative, Oklahoma City, Okla., 1950-1952.

HAND, JOHN A.
Local Representative, Muncie, Ind., 1950-1952.

HANLEY, E. L.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

HANNA, GEORGE D.
Local Representative, Flint, Mich., 1950-1952; Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1951-1952.

HANNAH, W. D.
Local Representative, Columbus, Ga., 1951-1952.

HARDACRE, G. K.
Chairman, Committee on Constitution and By-Laws, 1950-1952; Medal Award Committee, 1951-1952; Committee on Street and Highway Lighting, 1950-1952; Sub-Committee on Program and Publicity and Special Sub-Committee on Standard Practice of the Committee on Street and Highway Lighting, 1950-1951.

HARDING, JAMES P.
Advisory Group from National Restaurant Association of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

HARDING, W. T.
Aviation Lighting Committee, 1950-1951.

HARDMAN, W. S.
Local Representative, London, Ont., 1950-1952.

HARGEST, H.
Sub-Committee on Lighting in Steel Mills of the Committee on Lighting Study Projects in Industry, 1950-1952.

HARLANDER, C. V.
Local Representative, Everett, Wash., 1950-1951.

HARMON, THEODORE S.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952; Publicity Chairman, 1950-1951; Research Committee, 1950-1951.

HARPER, S. B.
Local Representative, Durham, N. C., 1950-1952.

HARRIS, A. L.
Local Representative, Wichita, Kan., 1950-1952.

HARRISON, J. D.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1952.

HARRISON, WARD
Board of Fellows, 1950-1952; Committee on Standards of Quality and Quantity for Interior Illumination, 1950-1952.

HARSH, M. C.
Committee on Protective Lighting, 1950-1952.

HART, C. E.
Local Representative, Findlay, Ohio, 1950-1952.

HARTENSTEIN, R. F.
Treasurer, 1950-1952; Council Executive Committee, 1950-1952; Finance Committee, 1950-1952; National Technical Conference Committee, 1951-1952; Chairman, 1950-1951; Trustee, I.E.S. Retirement Pension Plan, 1951-1952.

HARTLEY, B. H.
Chairman, Arizona Chapter, 1951-1952.

HARVEY, H. F., JR.
Sub-Committee on Marine Lighting of the Committee on Public Conveyances — Interior Lighting 1951-1952.

HATCH, E.
Committee on Public Conveyances — Interior Lighting, 1950-1952.

HAVENER, R. F.
Committee on Mine Lighting, 1951-1952.

HAWKINS, ELBERT A.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

HAWKINS, E. T.
Committee on Streets and Highway Lighting, 1950-1951; Special Sub-Committee on Photographic Studies of the Committee on Street and Highway Lighting, 1950-1951.

HAWKINS, W. E.
Committee on Street and Highway Lighting, 1951-1952; Chairman, Sub-Committee on Photographic Studies of the Committee on Street and Highway Lighting 1951-1952; Executive Sub-Committee of the Committee on Street and Highway Lighting, 1951-1952.

HAYNES, HOWARD
Chairman, Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

HAYNES, JOHN W.
Local Representative, Dover, N. J., 1950-1952.

HAYS, J. L.
Committee on Street and Highway Lighting, 1950-1952 Executive Sub-Committee on Street and Highway Lighting, 1950-1952; Chairman, Sub-Committee on Sign Traffic Lighting of the Committee on Street and Highway Lighting, 1950-1952; Special Sub-Committee on Standard Practice of the Committee on Street and Highway Lighting, 1950-1951.

HAZARD, C. R.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

HAZLETON, S. H., JR.
Sub-Committee on Lighting in the Canning Industry of the Committee on Lighting Study Projects in Industry, 1950-1952.

HEBERT, DIONIS D.
Local Representative, Trois-Rivieres, Que., Can., 1950-1952.

HECKMAN, L. F.
Committee on Street and Highway Lighting, 1950-1952; Chairman, Sub-Committee on Pavement Surfaces and Safety Lighting of the Committee on Street and Highway Lighting, 1951-1952; Executive Sub-Committee of the Committee on Street and Highway Lighting, 1951-1592; Sub-Committee on Program and Publicity of the Committee on Street and Highway Lighting, 1950-1951.

HEIM, WILLIAM H.
Local Representative, Sunbury, Pa., 1950-1952.

HEINE, J. L.
Committee on Public Conveyances — Interior Lighting, 1950-1952.

HEINS, FRANK E.
Chairman, Eastern Pennsylvania Section, 1951-1952; Local Representative, Reading, Pa., 1950-1952.

HEINTZE, E. D.
Section and Chapter Representative of the Membership Committee, 1951-1952.

HEINZ, B. T.
Regional Chairman, Committee on Membership, 1950-1951.

HELMBRIGHT, H. H.
Committee on Public Conveyances — Interior Lighting, 1950-1952.
Committee on Color and Illumination, 1950-1952.

HEMELT, B. A.
Sub-Committee on Taxiway Lighting and Sub-Committee on Airport Lighting of the Aviation Lighting Committee, 1950-1951.

HENDRICKS, R. M.
Chairman, Connecticut Section, 1950-1951.

HENDRICKSON, V. E.
Section and Chapter Representative of the Membership Committee, 1951-1952.

HENKEL, F. C.
Local Representative, Oregon City, Ore., 1950-1951.

HENKMANN, L. F.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

HENNINGER, JOHN G.
Local Representative, Kingston, Pa., 1950-1952.

HERBERT, J. S.
Daylighting Committee, 1950-1952.

HERR, R. L.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

HERRING, RALPH
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

HIBBEN, S. G.
President, 1951-1952; Vice-President, 1950-1951; Chairman, Council Executive Committee, 1951-1952; Member, 1950-1951; Official Representative, Sub-Committee on Organized Public Support of the President's Highway Safety Conference, 1951-1952; Representative, U. S. National Committee of the International Commission on Illumination, 1951-1952; Chairman, Historical Committee, 1950-1951; Chairman, Advisory Board on Committee Personnel, 1950-1951; Chairman, Technical Conference Forum, 1950-1951; Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1951.

HICKERSON, J. M.
Committee on Public Relations and Information, 1950-1951.

HILDEBRAND, PAUL H.
Vice-President, East Central Region, 1951-1952; Committee on Local Activities, 1951-1952; Chairman, Committee on Farm Lighting, 1951-1952; Representative, Sub-Committee on Revision of the Present Farm Handbook, 1951-1952; Chairman, Committee on Farm Buildings and Work Area Lighting, 1950-1951; Papers Committee, 1950-1951; Committee on Lighting Service, 1950-1951; Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951; Representative to the Industry Committee in connection with the Revision of the Present Handbook, 1950-1951.

HILEMAN, D. V.
Section and Chapter Representative of the Membership Committee, 1951-1952.

HILL, O. A., JR.
Chairman, Sub-Committee on Lighting in Laundries of the Committee on Lighting Study Projects in Industry, 1950-1952; Chairman, Sub-Committee on Lighting in the Fluid Milk Industry of the Committee on Lighting Study Projects in Industry, 1950-1951.

HILL, R. R.
Sub-Committee on Lighting in Laundries of the Committee on Lighting Study Projects in Industry, 1950-1952.

HILLER, R. H.
Secretary, Georgia Section, 1950-1951.

HINCKLEY, A. D.
Advisory Board on Committee Personnel, 1950-1952; Committee on National Technical Conference, 1950-1952.

HINGSTON, GEORGE N.
Daylighting Committee, 1950-1952.

HIRD, W. C.
Chairman, Inland Empire Chapter, 1950-1951.

HOBBS, L. A.
Director, 1950-1952; Committee on Public Relations and Information, 1951-1952.

HODGES, JAMES A.
Regional Chairman, Committee on Membership, 1950-1951; Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

HOFFMAN, CHARLES
Local Representative, Toledo, Ohio, 1951-1952.

HOLDEN, O. W.
Committee on Street and Highway Lighting, 1950-1951; Special Sub-Committee on Standard Practice of the Committee on Street and Highway Lighting, 1950-1951.

HOLLADAY, L. L.
Local Representative, Charlottesville, Va., 1950-1952.

HOLLINGSWORTH, J. M.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

HOLLINGSWORTH, K. E.
Vice-President, Pacific Northwest Region, 1950-1952; Committee on Local Activities, 1950-1952; Committee on Lighting for Civil Defense, 1951-1952; Task Committee on Lighting for Civilian Defense, 1950-1951.

HOLLISTER, C. D.
Committee on Lighting Study Projects in Industry, 1950-1952.

HOLTMAN, H. L.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

HOLTSINGER, EDGAR M.
Secretary, Florida Chapter, 1950-1951.

HOOKS, GEORGE M.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1952.

HOOT, R. M.
Secretary, Philadelphia Section, 1950-1952; Committee on Street and Highway Lighting, 1950-1952; Sub-Committee of Lighting Advisors for the East Coast of the Committee on Lighting for Civilian Defense, 1951-1952; Chairman, Special Sub-Committee on Photographic Studies of the Committee on Street and Highway Lighting, 1950-1951; Executive Sub-Committee, Sub-Committee on Sign Lighting, and Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

HOPKINSON, GEORGE.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

HORN, CAROLINE E.
Residence Lighting Forums Committee, 1950-1952; General Board of Examiners, 1950-1951; Papers Committee, 1950-1951; Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950- 1951.

HORN, W. W.
Vice-Chairman, Papers Committee, 1950-1951.

HORNBY, JOHN T.
Chairman, Ottawa Chapter, 1950-1951.

HORTON, BENTON O.
Local Representative, Mason City, Iowa, 1950-1952.

HORTON, FENN C.
Local Representative, Davenport, Iowa, 1950-1952.

HORTON, G. A.
Committee on Testing Procedures for Illumination Characteristics, 1950-1952.

HORTON, H. M.
Committee on Mine Lighting, 1950-1952; Chairman, Georgia Section, 1950-1951.

HOXIE, JOHN P.
Local Representative, Corning, N. Y., 1950-1951; Aviation Lighting Committee, 1950-1951; Sub-Committee on Taxiway Lighting of the Aviation Lighting Committee, 1950-1951.

HOWARD, TOM
Committee on Lighting for Television Production, 1951-1952.

HUBBS, E. W.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

HUERKAMP, E. C.
Chairman, Publications Committee, 1950-1952.

HULL, J. H.
Chairman, Membership Committee, 1950-1951; Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

HULSE, SHIRLEY
Committee on Lighting Study Projects in Industry, 1950-1952.

HUMBERT, W. F.
Local Representative, Milledgeville, Ga., 1951-1952.

HUNT, JAMES L., JR.
Local Representative, Salem, Ore., 1950-1951.

HUNT, KEITH E.
Local Representative, Monroe, Mich., 1950-1952.

HUNT, O. D.
Local Representative, Manhattan, Kan., 1950-1952; Committee on Lighting Education, 1950-1952; Committee on Farm Lighting, 1951-1952; Committee on Farm Buildings and Work Area Lighting, 1950-1951.

HUNTSMAN, SHIRLEY W.
Local Representative, Grand Junction, Colo., 1951-1952.

HURLEY, RAY
Committee on Lighting and Architecture, 1950-1952.

HUTCHINSON, H. A.
Local Representative, Norwalk, Conn., 1950-1952.

I

ILGNER, H. F.
Committee on Street and Highway Lighting, 1950-1952; Executive Sub-Committee on Street and Highway Lighting, 1950-1952; Chairman, Sub-Committee on Coordination of the Committee on Street and Highway Lighting, 1950-1952; Committee on Sports and Recreational Lighting, 1950-1952; Representative to Institute of Traffic Engineers, Joint Committee on Highway Lighting, 1950-1952; Special Sub-Committee on Revision of 1927 Report "Principles of Street Lighting" and Special Sub-Committee on Standard Practice of the Committee on Street and Highway Lighting, 1950-1951.

IZANT, G. W.
Committee on Street and Highway Lighting, 1950-1952; Special Sub-Committee on Standard Practice and Sub-Committee on Research of the Committee on Street and Highway Lighting, 1950-1951.

J

JACKSON, R. R.
Committee on Lighting for Civil Defense, 1951-1952; Local Representative, Edmonton, Alb., 1950-1951; Task Committee on Lighting for Civilian Defense, 1950-1951.

JACOBUS, NEAL
Chairman, Western New York Section, 1951-1952; Chairman, Committee on Lighting Design Practice, 1950-1952; Joint Sub-Committee, I.E.S. - U. S. Public Health Committee, 1950-1952.

JAMES, H. S.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

JAMES, L. V.
Committee on School Lighting, 1950-1952; Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952; Committee on Constitution and By-Laws, 1950-1952; Sub-Committee on Brightness Conditions in Educational Environments of the Committee on School Lighting, 1950-1951.

JAMES, R. L.
Local Representative, New Castle, Pa., 1950-1952.

JAMISON, J. S., JR.
Local Representative, Lexington, Va., 1950-1952.

JAQUA, BYRON
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

JEFFREY, FRANK R.
Committee on Sports and Recreational Area Lighting, 1950-1952.

JEFFREY, KENNETH R.
Secretary, Montreal Section, 1950-1951.

JENSEN, B. J.
Chairman, Handbook Revision Committee, 1950-1952.

JENSEN, CARL F.
Sub-Committee on Lighting in Laundries of the Committee on Lighting Study Projects in Industry, 1950-1952.

JERVIS, WAYNE
Sub-Committee on Chalkboards of the Committee on School Lighting, 1950-1951.

JOHNSON, L. M.
Committee on Street and Highway Lighting, 1950-1952; Special Sub-Committee on Standard Practice of the Committee on Street and Highway Lighting, 1950-1951. Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

JOHNSON, L. T.
Sub-Committee on Sign Lighting of the Committee on Street and Highway Lighting, 1950-1951.

JONES, DUNCAN M.
Director, 1950-1952; Chairman, Procedures and Policies Committee, 1950-1952; Handbook Revision Committee, 1950-1952; Task Committee on Advance Planning, 1950-1952; Sustaining Membership Committee, 1950-1951.

JONES, E. DEMPSEY
Local Representative, Charlotte, N. C., 1950-1951.

JONES, FRANK H.
Local Representative, Lowell, Mass., 1950-1952.

JONES, H. C.
Sub-Committee on Lighting in Auditoriums and Churches of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952; Sub-Committee on Chalkboards of the Committee on School Lighting, 1950-1951.

JONES, HENRY R.
Coordinating Committee for Defense, 1950-1952.

JONES, J. R.
Committee on Store Lighting, 1950-1952; Committee on Lighting Design Practice, 1950-1952; Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

JONES, J. W.
Local Representative, Tiffin, Ohio, 1950-1951.

JONES, L. A.
Nomenclature Committee, 1950-1952.

JORDAN, A. B.
Local Representative, Cleveland, Tenn., 1950-1951.

JORGENSEN, T. O.
General Board of Examiners, 1950-1952.

K

KAHLER, W. H.
Committee on School Lighting, 1950-1952; Committee on Lighting Study Projects in Industry, 1950-1952; Committee on Mine Lighting, 1950-1952; Industrial Lighting Committee, 1950-1952; Committee on Illumination Performance Recommendations, 1950-1952; Committee on Color and Illumination, 1950-1952; Chairman, Sub-Committee on Supplementary Lighting of the Committee on Lighting Study Projects in Industry, 1950-1952; Sub-Committee on Brightness Conditions in Educational Environments of the Committee on School Lighting, 1950-1951; Representative A.S.A. Committee Z53, 1950-1951.

KALFF, L. C.
Committee on Progress, 1950-1951.

KAMMERER, G. M.
Local Representative, Wausau, Wis., 1950-1952.

KARNS, E. B.
Committee on Street and Highway Lighting, 1950-1952; Special Sub-Committee on Standard Practice, Sub-Committee on Study Assignments in Accident Surveys, and Sub-Committee on Coordination of the Committee on Street and Highway Lighting, 1950-1951.

KAUFFMAN, P. F.
Sustaining Membership Committee, 1950-1952; Committee on Public Relations and Information, 1950-1951.

KAVANAUGH, W. F.
Sub-Committee on Pavement Surfaces and Safety Lighting of the Committee on Street and Highway Lighting, 1950-1951.

KECK, MERLE
Vice-Chairman, Committee on Sports and Recreational Area Lighting, 1951-1952; Member, 1950-1951; Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

KEENE, HARRY
Industrial Lighting Committee, 1950-1952; Office Lighting Committee, 1950-1952.

KEESLER, ALLEN J.
Secretary, Florida Chapter, 1951-1952.

KEISTER, T. F.
Local Representative, Dayton, Ohio, 1950-1951.

KEIFFER, MILES
Secretary, Eastern Pennsylvania Chapter, 1951-1952.

KELLER, C. C.
Secretary, 1951-1952; Council Executive Committee, 1951-1952; Chairman, Task Committee on Advance Planning, 1951-1952; Member, 1950-1951; Finance Committee, 1950-1951.

KELLER, J. A., JR.
Local Representative Greenville, S. C., 1951-1952.

KELLEY, E. A.
Committee on Public Relations and Information, 1950-1951.

KELLEY, W. L., JR.
Local Representative, Pawtucket, R. I., 1950-1952; Chairman, Committee on Lighting Study Projects in the Textile Industry, 1950-1952.

KELLY, C. L.
Local Representative, Scottsbluff, Nebraska, 1951-1952.

KELLY, THOMAS S.
Representative, A.S.A. Sectional Committee C78, 1950-1952; Progress Committee, 1950-1951; Residence Lighting Committee, 1950-1951; Sub-Committee on Home Lighting Data Sheets of the Publications Committee, 1950-1951.

KELSEY, E. W.
Local Representative, Harrisburg, Pa., 1950-1952.

KENNEDY, W. B.
Committee on Lighting Education, 1950-1952; Sub-Committee on Lighting in Auditoriums and Churches of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

KENT, S. G.
Local Representative, Miami Beach, Fla., 1951-1952.

KETCH, J. M.
Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

KEVERN, G. M.
Aviation Lighting Committee, 1950-1951; Sub-Committee on Aviation Lamps, Sub-Committee on Aircraft Lighting, Sub-Committee on Taxiway Lighting, and Sub-Committee on Compendium for Signal Lighting of the Aviation Lighting Committee, 1950-1951.

KEYS, PAUL E.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

KIDD, J. A. I.
Chairman, Toronto Section, 1951-1952.

KIGHT, LUCIAN T.
Committee on Lighting and Architecture, 1950-1952; Sub-Committee on Lighting in Steel Mills of the Committee on Lighting Study Projects in Industry, 1950-1952.

KILBURN, COLLEN H.
Local Representative, Greenfield, Mass., 1950-1952.

KIMERY, W. T.
Secretary, Southwestern Section, 1951-1952.

KING, CLYDE E.
Local Representative, Wilmington, N. C., 1950-1952.

KING, P. E.
Committee on Lighting of Central Station Properties, 1950-1951.

KING, G. D.
Secretary, Puget Sound Section, 1951-1952.

KING, PAUL E.
Committee on Lighting of Central Station Properties, 1951-1952.

KINNAIRD, JOHN S.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

KIRKPATRICK, E. T.
Local Representative, Edmonton, Alberta, Canada, 1951-1952.

KLIEGL, HERBERT A.
Chairman, Committee on Lighting for Television Production, 1951-1952; Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952; Representative, Society of Motion Picture and Television Engineers, 1950-1952.

KLINE, L. A.
Sub-Committee on Lighting in the Textile Industry of the Committee on Lighting Study Projects in Industry, 1950-1952.

KNIGHT, H. W.
Local Representative, Streator, Ill., 1951-1952.

KNIGHT, W. D.
Local Representative, Amarillo, Texas, 1950-1951.

KNOWLES, F. L.
Daylighting Committee, 1950-1952.

KNUDSTRUP, AKSEL
Professional Requisites Committee, 1950-1951.

KOLB, W. S.
Secretary, Cleveland Section, 1951-1952.

KORTEN, G. E.
Committee on Street and Highway Lighting, 1950-1952; Executive Sub-Committee on Street and Highway Lighting, 1950-1952; Chairman, Special Sub-Committee on I.E.S. Lighting Handbook and Special Sub-Committee on Photographic Studies of the Committee on Street and Highway Lighting, 1950-1951.

KOVEN, ARTHUR
Joint Sub-Committee I.E.S. - U. S. Public Health Service of the Committee on Lighting Education, 1951-1952.

KRAEHENBUEHL, J. O.
Vice-Chairman, Nomenclature Committee, 1950-1952; Committee on Lighting Design Practice, 1950-1952; Local Representative, Urbana, Ill., 1950-1952; Chairman, Professional Requisites Committee, 1950-1951.

KRAEMER, K. E.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

KRAMER, ARTHUR
Committee on Farm Lighting, 1951-1952; Committee on Farm Buildings and Work Area Lighting, 1950-1951.

KRAUS, KENNETH H.
Local Representative, Mankato, Minn., 1951-1952.

KRAWCEK, A. E.
Committee on Testing Procedures for Illumination Characteristics, 1950-1952.

KRAYBILL, E. K.
Committee on Lighting Education, 1950-1952.

KREITZBERGER, HOWARD J.
Local Representative, Hazleton, Pa., 1950-1952.

KREYSER, ROY H.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952; Committee on Public Relations and Information, 1950-1951.

KRIDEL, NORMAN T.
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

KRIEGER, JAMES
Committee on Public Relations and Information, 1950-1952.

KRISTOF, J. A.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

KROMHOUT, JOHAN C.
Committee on Color and Illumination, 1950-1952.

KUZELL, ROBERT J.
Secretary, Georgia Section, 1951-1952.

KYACK, PAUL F.
Committee on Lighting Service, 1950-1951.

L

LABEY, F. P.
Vice-President, Canadian Region, 1951-1952; Committee on Local Activities, 1951-1952; Committee on Public Relations and Information, 1951-1952; Chairman, Montreal Section, 1950-1951.

LAFOND, EDWARD F.
Local Representative, Wilmington, Del., 1950-1952.

LAGEMAN, C. E.
Local Representative, Green Bay, Wis., 1950-1952.

LAMPERT, EMIL W.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

LANDERS, L. E.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

LANFORD, V. W.
Local Representative, Ft. Lauderdale, Fla., 1950-1951.

LANGE, R. E.
Sustaining Membership Committee, 1950-1951.

LANGSTAFF, WILLIAM M.
Local Representative, Huntington, W. Va., 1950-1951.

LANSING, J. H.
Sub-Committee on Lighting in Foundries of the Committee on Lighting Study Projects in Industry, 1950-1952.

LANSINGH, VAN R.
Historical Committee, 1950-1952.

LARSON, ARTHUR P.
Progress Committee, 1950-1952; Committee on Testing Procedures for Illumination Characteristics, 1950-1952; Sub-Committee on Lighting in Kitchens, Lunchrooms, Cafeterias and Dining Areas of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952; Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

LARSON, F. P., JR.
Section and Chapter Representative of the Membership Committee, 1951-1952.

LARSON, L. C.
Local Representative, Madison, Wis., 1950-1952.

LAUER, WILLIAM
Committee on Street and Highway Lighting, 1951-1952.

LAUFER, M. K.
Sub-Committee on Aircraft Lighting of the Aviation Lighting Committee, 1950-1951.

LAUPP, CHARLES N.
Vice-President, Midwestern Region, 1951-1952; Committee on Constitution and By-Laws, 1950-1952; Committee on School Lighting, 1950-1952; Committee on Local Activities, 1950-1952; National Technical Conference Committee, 1951-1952; Regional Vice President, 1950-1951; Chairman, Milwaukee Section, 1950-1951; Sub-Committee on Brightness Conditions in Educational Environments of the Committee on School Lighting, 1950-1951.

LAUTH, EDWIN H.
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

LAWRENCE, TED
Committee on Lighting for Television Production, 1951-1952.

LEACH, G. D., JR.
Chairman, Florida Chapter, 1951-1952.

LEBLANC, J. E.
Committee on Mine Lighting, 1950-1952.

LECORNU, SAMUEL B.
Chairman, Tennessee Valley Chapter, 1951-1952.

LEE, CLAUDIUS
Local Representative, Blacksburg, Va., 1950-1952.

LEE, J. W.
Chairman, Committee on Protective Lighting, 1950-1952; Committee on Sports and Recreational Lighting, 1950-1952.

LEES, D. D.
Local Representative, Atlantic City, N. J., 1950-1952.

LEGALLAIS, W.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

LEHMAN, CHARLES
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

LEVY, ARTHUR A.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

LEWELLEN, WARREN K.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

LEWIS, A. L.
Aviation Lighting Committee, 1950-1951; Sub-Committee on Taxiway Lighting of the Aviation Lighting Committee, 1950-1951.

LEWIS, CARTER
Committee on Lighting Education, 1950-1952; Committee on Lighting of Central Station Properties 1950-1952; Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

LEWIS, J. W.
Local Representative, Greenville, S. C., 1950-1951.

LIEBIG, CARL
Local Representative, Pittsburgh, Kan., 1950-1952.

LIGARE, ROBERT
Committee on Lighting Education, 1950-1952; Joint Sub-Committee I.E.S. - U. S. Public Health Committee, 1950-1951.

LIND, WALTER J.
Project Sub-Committee on Recommendations for Specific Areas of the Office Lighting Committee, 1950-1951.

LINDSAY, E. A.
Secretary, Industrial Lighting Committee, 1950-1952; Sub-Committee on Supplementary Lighting of the Committee on Lighting Study Projects in Industry, 1950-1952; Representative, A.S.A. Sectional Committee A11, 1950-1952.

LISCH, WILLIAM
Section and Chapter Representative of the Membership Committee, 1951-1952; Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

LITTLE, MRS. W. F.
Librarian, Historical Committee, 1950-1952.

LITTLE, W. F.
Daylighting Committee, 1950-1952; Committee on Illumination Performance Recommendations, 1950-1952; Nomenclature Committee, 1950-1952; Residence Lighting Committee, 1950-1952; Committee on Testing Procedures for Illumination Characteristics, 1950-1952; Representative to Intef-Society Color Council, 1950-1952; Committee on Lighting for Civil Defense, 1951-1952; Task Committee on Lighting for Civilian Defense, 1950-1951.

LITTLEFIELD, JAMES C.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

LITTLEFIELD, P. N.
Local Representative, Marietta, Ga., 1950-1952.

LIVERMORE, J. N.
Committee on Lighting and Air Conditioning, 1951-1952.

LOCKE, H. G.
Chairman, Rochester Chapter, 1951-1952; Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

LOGAN, H. L.
Committee on Standards of Quality and Quantity for Interior Illumination, 1950-1952; Committee on Color and Illumination, 1950-1952; Representative to Inter-Society Color Council, 1950-1952; Chairman, Research Committee, 1950-1951; Professional Requisites Committee, 1950-1951.

LOGAN, PAUL P.
Advisory Group from National Restaurant Association of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

LONG, HOWARD
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1952.

LONG, ROBERT
Sub-Committee on Artificial Moonlight Project of the Coordinating Committee for Defense, 1951-1952.

LOTHROP, R. K.
Local Representative, Shreveport, La., 1950-1952.

LOUARGAND, ANDREW
Secretary, Mother Lode Chapter, 1950-1951.

LOVE, R. M.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1951-1952.

LOWE, GORDON
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

LOWELL, W. P.
Technical Committee Forum, 1950-1952; Industrial Lighting Committee, 1950-1952; Committee on Lighting Study Projects in Industry, 1950-1952.

LOWRY, E. F.
Board of Fellows, 1951-1952; Chairman, Committee on Light Sources, 1950-1952; Committee on Lighting Maintenance, 1950-1952.

LUCAS, R. O.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

LUCKIESH, M.
Medal Award Committee, 1950-1952.

LUNDELL, CARL H.
Committee on Street and Highway Lighting, 1950-1952; Sub-Committee on Public Lighting and Traffic Safety of the Committee on Street and Highway Lighting, 1950-1951.

LUNDI, JOHN E.
Local Representative Ashtabula, Ohio, 1950-1952.

LUSHINGTON, HENRY
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952 Chairman, Maritime Chapter, 1950-1951.

LUSK, R. R.
Chairman, Chicago Section, 1951-1952; Committee on Lighting and Air Conditioning, 1950-1952; Committee on Lighting Education, 1950-1952; Residence Lighting Forums Committee, 1951-1952; Committee on Lighting Study Project in Laundries, 1950-1952; Joint Sub-Committee, I.E.S.-U. S. Public Health Committee, 1950-1951.

LYNN, THOMAS J.
Local Representative, Amarillo, Texas, 1951-1952.

LYON, LESLIE D.
Local Representative, Jackson, Mich., 1950-1952; Sub-Committee on Lighting in Auditoriums and Churches of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1951-1952.

LYON, R. W.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

LYONS, LEO
Advisory Group from National Restaurant Association of the Committee on Lighting Study Projects in Public Buildings and Private Institutions 1950-1952.

M

MACBETH, NORMAN
Official Representative, Inter-Society Color Council Committee, 1951-1952; Chairman, 1950-1951; Committee on Color and Illumination, 1950-1952.

MacELMON, E. L.
Chairman, Maritime Chapter, 1951-1952; Secretary, 1950-1951.

MacGREGOR, C. C.
Chairman, Hamilton, Ontario Chapter, 1951-1952.

MACHAMER, H. E.
Daylighting Committee, 1950-1952.

MACKENZIE, L. W.
Secretary, Winnipeg Chapter, 1951-1952.

MACY, C. W.
Office Lighting Committee, 1950-1952; Project Sub-Committee on Recommendations for Specific Areas and Project Sub-Committee on Performance of Lighting Systems of the Committee on Office Lighting, 1950-1951.

MADIGAN, R. E.
Aviation Lighting Committee, 1950-1951; Chairman, Sub-Committee on Papers, Sub-Committee on Airport Lighting and Executive Sub-Committee of the Aviation Lighting Committee, 1950-1951.

MAGDSICK, H. H.
Chairman, Sub-Committee on Editorial Content of the Publications Committee, 1950-1952; Publications Committee, 1950-1952; Board of Fellows, 1950-1951.

MAHAFFEY, H. J.
Project Committee on Characteristics of Office Materials and Equipment and Related Environmental Factors of the Committee on Office Lighting, 1950-1951; Project Sub-Committee on Performance of Lighting Systems of the Committee on Office Lighting, 1950-1951.

MAHAN, H. E.
Committee on Protective Lighting, 1950-1952.

MAHON, FRANK B.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

MAIER, DOUGLAS
Committee on Lighting and Architecture, 1950-1952.

MAJOR, WILLIAM R.
Section and Chapter Representative of the Membership Committee, 1951-1952.

MANCHESTER, PAUL
Coordinating Committee for Defense, 1950-1952; Vice-Chairman, Sub-Committee of Lighting Advisors for the East Coast of the Committee on Lighting for Civil Defense, 1951-1952.

MANLOVE, B. G.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

MANWARING, A. H.
Vice-President, 1951-1952; Vice-Chairman, Technical Committee Forum, 1951-1952; Council Executive Committee, 1950-1952; Chairman, Committee on Local Activities, 1951-1952; Task Committee on Advance Planning, 1951-1952; General Secretary, 1950-1951; Research Fund Committee, 1950-1951; Task Committee to Study Possible Change in I.E.S. Fiscal Year, 1950-1951; Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

MARKEL, MORRIS L.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

MARKER, VAN EDWARD
Committee on Protective Lighting, 1950-1952.

MARKLE, D. L.
Committee on Testing Procedures for Illumination Characteristics, 1950-1951.

MARLIN, J. M.
Sub-Committee on Lighting in Sheet Metal, Stamping, Folding and Shearing of the Committee on Lighting Study Projects in Industry, 1950-1952.

MARSHALL, J. WILSON
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

MARTIN, BUFORD H.
Local Representative, Chattanooga, Tenn., 1950-1952.

MARTIN, C. O.
Vice-President, South Pacific Coast Region, 1951-1952; Regional Vice-President, 1950-1951; Committee on Local Activities, 1950-1952; Chairman, Sub-Committee on Lighting in the Canning Industry of the Committee on Lighting Study Projects in Industry, 1950-1952.

MARTINEAU, ROMEO
Chairman, Quebec Chapter, 1951-1952; Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951; Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

MARQUARDT, J. W.
Local Representative, Springfield, Ill., 1950-1951.

MASON, DAVID H.
Chairman, Sub-Committee on Lighting in Auditoriums and Churches of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

MASON, HAROLD
Committee on Street and Highway Lighting, 1951-1952.

MASTERSON, C. T.
Sub-Committee on Lighting in Kitchens, Lunchrooms, Cafeterias and Dining Areas of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

MATTHEWS, W. C.
Local Representative, Savannah, Ga., 1951-1952.

MAULDING, D. A.
Local Representative, Gresham, Ore., 1950-1951.

MAUSK, R. E.
Sub-Committee on Supplementary Lighting of the Committee on Lighting Study Projects in Industry, 1950-1952.

MAYNARD, ROGER
Committee on Lighting Service, 1950-1951.

MAZUR, H. J.
Sub-Committee on Lighting in Steel Mills of the Committee on Lighting Study Projects in Industry, 1950-1952.

McCALLEY, ROBERT L.
Chairman, Baltimore Chapter, 1950-1951.

McCLEAREN, D. L.
Secretary, Tennessee Valley Chapter, 1951-1952.

McCORD, J. D.
Local Representative, Fitzgerald, Ga., 1951-1952.

McCORD, MILTON M.
Sub-Committee of Section and Chapter Repre-

sentatives of the Sustaining Membership Committee, 1950-1951.

McCORMICK, C. E.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

McCORMICK, CHARLES W.
Chairman, Connecticut Section, 1951-1952; Sub-Committee on Lighting in Auditoriums and Churches of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

McCORMICK, WILLIAM G.
Section and Chapter Representative of the Membership Committee, 1951-1952.

McCULLOCH, JAMES H.
Committee on Testing Procedures for Illumination Characteristics, 1950-1952; Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

McDONALD, J. GORDON
Secretary, Heart of America Section, 1951-1952.

McFARLAND, RAYMOND B.
Local Representative, Augusta, Me., 1950-1952.

McFEE, CHARLES W.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

McGINNIS, EDWARD J.
Secretary, Ohio Valley Section, 1951-1952.

McGUINNES, R. F.
Local Representative, Utica, N. Y., 1950-1951.

McGOUGH, JOHN F.
Committee on Street and Highway Lighting, 1950-1952; Special Sub-Committee on I.E.S. Lighting Handbook of the Committee on Street and Highway Lighting, 1950-1951.

McINTYRE, MARVIN
Local Representative, Santa Fe, New Mex., 1950-1951.

McKENZIE, D. J.
Secretary, Toronto Section, 1951-1952.

McKILLOP, A. H.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

McKINLEY, J. W.
Chairman, Western Michigan Chapter, 1951-1952.

McKINLEY, R. W.
Office Lighting Committee, 1950-1952; Daylighting Committee, 1950-1952; Chairman, Sub-Committee on Publications Sales and Distribution of the Publications Committee, 1950-1952; Papers Committee, 1950-1951; Publications Committee, 1950-1951; Sub-Committee on Editorial Content of the Publications Committee, 1950-1951.

McKINNEY, MEREDITH
Local Representative, Frankfort, Ky., 1950-1951.

McMASTERS, HARRY
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

McPHERSON, W. P.
Local Representative, Raleigh, N. C., 1951-1952.

McQUESTION, JAMES H.
Local Representative, Camden, N. J., 1950-1952.

McRAE, FRED B.
Local Representative, Westerville, Ohio, 1950-1951.

MEACHAM, J. A.
Daylighting Committee, 1950-1952; Progress Committee, 1950-1952; Committee on Color and Illumination, 1950-1952; Representative to Inter-Society Color Council, 1950-1952.

MEAKER, O. PHELPS
Committee on Testing Procedures for Illumination Characteristics, 1950-1952; Sub-Committee on Brightness Conditions in Educational Environments of the Committee on School Lighting, 1950-1951.

MEARA, JAY
Section and Chapter Representative of the Membership Committee, 1950-1952; Section and Chapter Representative of the Committee on Public Relations and Information, 1950-1952.

MEISSNER, O. W.
Committee on Lighting and Architecture, 1950-1952.

MELETIO, JAMES T.
Chairman, Southwestern Section, 1951-1952; Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

MENKE, WARREN
Local Representative, W. Lafayette, Indiana, 1951-1952; Nomenclature Committee, 1951-1952.

MIDDLETON, W. E. K.
Aviation Lighting Committee, 1950-1951; Editorial Board of Sub-Committee on Compendium for Signal Lighting, and Sub-Committee on Compendium for Signal Lighting of the Aviation Lighting Committee, 1950-1951.

MILES, LEO W.
Section and Chapter Representative of the Membership Committee, 1951-1952.

MILLER, C. D.
Committee on Lighting Education, 1950-1952; Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

MILLER, D. C.
Secretary, Aviation Lighting Committee, 1951-1952; Member, 1950-1951; Sub-Committee on Aircraft Lighting and Executive Sub-Committee of the Aviation Lighting Committee, 1950-1951.

MILLER, DON F.
Local Representative, Pendleton, Ore., 1950-1951.

MILLER, FLOYD O.
Local Representative, Newberg, Ore., 1950-1951.

MILLER, GLADYS
Committee on Color and Illumination, 1950-1952.

MILLER, HOWARD L.
Alternate Representative, American Standards Association Sectional Committee C78, 1950-1952.

MILLER, R. A.
Daylighting Committee, 1950-1952; Research Fund Committee, 1950-1951.

MILLER, W. E.
Committee on Lighting Education, 1951 1952.

MILLER, W. S. E.
Sub-Committee on Lighting in Laundries of the Committee on Lighting Study Projects in Industry, 1950-1952.

MILLS, G. D.
Co-Chairman, Coordinating Committee for Defense, 1950-1952; Committee on Lighting for Civil Defense, 1951-1952; Task Committee on Lighting for Civilian Defense, 1950-1951.

MILLS, R. O.
Local Representative, Waterbury, Conn., 1950-1952.

MINORS, CHARLES R.
Local Representative, Rome, Ga., 1950-1951.

MITTAUER, GEORGE C.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

MOLITOR, ARTHUR H.
Committee on Lighting and Architecture, 1950-1952.

MONTABONE, W. J.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1952.

MOODIE, E. W.
Sub-Committee on Chalkboards of the Committee on School Lighting, 1950-1951.

MOON, PARRY
Official Representative to Inter-Society Color Council, 1950-1952.

MOORE, ARTHUR R.
Local Representative, Charleston, S. C., 1950-1952.

MOORE, G. C.
Committee on Light Control and Equipment Design, 1950-1952.

MOORE, LEWIS B.
Chairman, Aviation Lighting Committee, 1950-1951; Chairman, Executive Sub-Committee of the Aviation Lighting Committee, 1950-1951.

MOORE, REX
Secretary, Mother Lode Chapter, 1951-1952.

MORALES SILVA, EDMUNDO
Chairman, Mexico Chapter, 1950-1951.

MORGAN, LEE W.
Local Representative, Hagerstown, Md., 1951-1952.

MORRIS, EDWIN E.
Chairman, Montreal Section, 1951-1952.

MORRIS, GEORGE L.
Local Representative, Birmingham, Ala., 1950-1951.

MORRIS, ROBERT
Committee on Lighting for Television Production, 1951-1952; Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

MORRIS, RUTH
Residence Lighting Forums Committee, 1950-1952; Sub-Committee on Home Lighting Data Sheets of the Publications Committee, 1950-1951.

MORRIS, WILLIAM H.
Local Representative, Coral Gables, Fla., 1951-1952.

MORRISON, GEORGE I.
Secretary, Inland Empire Chapter, 1951-1952; Committee on Public Relations and Information, 1950-1951.

MORSE, M. P.
Committee on Light Control and Equipment Design, 1950-1952.

MORTON, WALTER B.
Committee on Lighting of Central Station Properties, 1950-1951.

MOWRY, W. S.
Committee on Lighting of Central Station Properties, 1950-1952; Local Representative, Worcester, Mass., 1950-1952.

MUDGETT, G. F.
Board of Fellows, 1950-1952; Chairman, Hamilton, Ontario Chapter, 1950-1951.

MUELLER, FRANK E.
Chairman, Sub-Committee on Lighting in Foundries of the Committee on Lighting Study Projects in Industry, 1950-1952; Chairman, Cleveland Section, 1950-1951.

MUELLER, J. E.
Task Committee on Advance Planning, 1950-1952.

MUELLER, L. E.
Committee on Lighting and Air Conditioning, 1950-1952; Committee on Public Relations and Information, 1950-1951.

MUIR, D. REED
Daylighting Committee, 1950-1952.

MUNROE, W. A.
Sub-Committee on Student Vision and Scholarship of the Committee on School Lighting, 1950-1951.

MURRAH, JACK H.
Committee on Street and Highway Lighting, 1951-1952; Project Sub-Committee on Performance of Lighting Systems and Project Sub-Committee on Depreciation and Maintenance of Office Systems of the Office Lighting Committee, 1950-1951.

MUSE, NED S.
Local Representative, Evansville, Indiana, 1951-1952.

MUTCHLER, WILLIAM C.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

MYERS, MARTIN J., JR.
Local Representative, Tulsa, Okla., 1950-1952.

N

NADEAU, A. T.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

NAYSMITH, S. R.
Research Committee, 1950-1951; Sub-Committee on Advertising Sales of the Publications Committee, 1950-1951.

NEAL, F. M.
Committee on Light Control and Equipment Design, 1950-1952; Committee on Testing Procedures for Illumination Characteristics, 1950-1952.

NEAL, HARRY J.
Local Representative, Bay City, Mich., 1950-1952.

NEIDHART, JOHN J.
Chairman, Office Lighting Committee, 1951-1952; Member, 1950-1951; Store Lighting Committee, 1950-1952; Committee on Lighting Design Data, 1950-1952; Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952; Project Sub-Committee on Recommendations for Spe-

cific Areas of the Office Lighting Committee, 1950-1951.

NELSON, G. T.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

NEWELL, CLARK B.
Secretary, Utah Chapter, 1951-1952.

NEWHALL, R. S.
Committee on Street and Highway Lighting, 1950-1952; Sub-Committee on Public Lighting and Traffic Safety of the Committee on Street and Highway Lighting, 1950-1952; Executive Sub-Committee of the Committee on Street and Highway Lighting, 1951-1952; Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

NEWMAN, IRA
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

NICKERSON, DOROTHY
Committee on Color and Illumination, 1950-1952.

NICKERSON, J. C.
Committee on Lighting for Civil Defense, 1951-1952; Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1952; Task Committee on Lighting for Civilian Defense, 1950-1951.

NIEMEYER, L. A.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1952.

NIETZ, DONALD H.
Local Representative, Rochester, Minn., 1951-1952.

NOBLE, E. M.
Sub-Committee on Lighting in the Canning Industry of the Committee on Lighting Study Projects in Industry, 1950-1952.

NOPHSKER, ROBERT J.
Local Representative, Altoona, Pa., 1950-1952.

NORD, O. C.
Chairman, Eastern Pennsylvania Chapter, 1950-1951.

NORDQUIST, ROBERT G.
Aviation Lighting Committee, 1950-1951; Sub-Committee on Airport Lighting of the Aviation Lighting Committee, 1950-1951.

NORRIS, EARL J.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

NORTON, CAM
Local Representative, Toledo, Ohio, 1950-1951.

NORWOOD, E. E.
Chairman, Mississippi Chapter, 1951-1952.

NOSER, JOE A.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

NOTTELMAN W. F. C.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952; Publicity Chairman, 1950-1951.

NOYES, JOHN
Section and Chapter Representative of the Membership Committee, 1951-1952.

NUSSBAUM, H. W.
Section and Chapter Representative of the Membership Committee, 1951-1952.

O

OBER, E. C.
Secretary, San Jacinto Section, 1951-1952.

OBERHAUSEN, J. J.
Committee on Street and Highway Lighting, 1950-1952; Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

ODAY, A. B.
Committee on Light Sources, 1950-1952.

O'DONNELL, FLORENCE
Residence Lighting Forums Committee, 1950-1951.

OERTING, HAROLD V.
Secretary Conference Executive Sub-Committee of the Committee on National Technical Conference, 1950-1951.

OETTING, R. L.
Office Lighting Committee, 1950-1952; Official Representative, National Office Management Association, Committee on Physical and Physiological Factors, 1950-1952; Representative, A.S.A. Committee X2, 1950-1952; Chairman, Project Sub-Committee on Task Evaluation of the Office Lighting Committee, 1950-1951.

OGDEN, FRED
Regional Chairman, Committee on Membership, 1950-1951; Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

OLDHAM, VICTOR
Local Representative, Halifax, N. S., 1950-1952.

OLDS, C. B.
Local Representative, Alliance, Ohio, 1951-1952.

OLSEN, ROBERT E.
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

O'NEILL, D. J.
Committee on Lighting of Central Station Properties, 1950-1952.

ORR, JAMES F., JR.
Local Representative, Peoria, Ill., 1950-1952.

ORTLIEB, O. P.
Committee on Street and Highway Lighting, 1950-1952; Representative to National Research Council, Highway Research Board, 1950-1952; Special Sub-Committee on Revision of 1927 Report "Principles of Street Lighting" of the Committee on Street and Highway Lighting, 1950-1951; Sub-Committee on Sign Lighting of the Committee on Street and Highway Lighting, 1950-1951.

OSBORN, C. L.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

OSBORNE, HENRY W.
Committee on Street and Highway Lighting, 1950-1952; Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952; Sub-Committee on Pavement Surfaces and Safety Lighting; Sub-Committee on Coordination of the Committee on Street and Highway Lighting, 1950-1951.

O'SHEA, CARROLL L.
Chairman, New York Section, 1950-1951.

OSTROM, CARLTON
Sub-Committee on Lighting in Steel Mills of the Committee on Lighting Study Projects in Industry, 1950-1952.

OWSLEY, CHARLES
Local Representative, N. Kansas City, Mo., 1950-1952.

P

PAGE, AILEEN
Sub-Committee on Home Lighting Data Sheets of the Publications Committee, 1950-1951.

PAIST, L. B.
Task Committee on Conference with the National Council for School House Construction, 1950-1951; Sub-Committee on Brightness Conditions in Educational Environments of the Committee on School Lighting, 1950-1951.

PALMER, ROY A.
Director, 1950-1952; Co-Chairman, Papers Committee, 1951-1952; Committee on Public Relations and Information, 1950-1952; Committee on Street and Highway Lighting, 1951-1952; Representative to U. S. National Committee of the International Commission on Illumination, 1950-1952; Sub-Committee of Lighting Advisors for the East Coast of the Committee on Lighting for Civil Defense, 1951-1952;; Committee on Lighting Service, 1950-1951; Sub-Committee on Editorial Content of the Publications Committee, 1950-1951.

PARKER, A. E.
Official Representative to Inter-Society Color Council, 1950-1952.

PARKER, D. G.
Chairman, Inland Empire Chapter, 1951-1952.

PARKER, W. D.
Local Representative, Montgomery, Ala., 1951-1952.

PARKS, EARL E.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

PARKS, J. P.
Committee on Lighting Study Projects in Industry, 1950-1952.

PARKS, L. G.
Committee on Lighting of Central Station Properties, 1950-1952.

PARSONS, J. F.
Committee on Lighting Education, 1950-1952; Committee on Lighting Design Data, 1950-1952; Committee on Illumination Performance Recommendations, 1950-1952; Chairman, Joint Sub-Committee I.E.S.-U. S. Public Health Service, 1950-1952.

PARSONS, JESSE R.
Local Representative, Massillon, Ohio, 1950-1952.

PARTRIDGE, W. T.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

PASLAY, R. CECIL
Vice-President, Southern Region, 1951-1952; Chairman, New Orleans Section, 1951-1952; Committee on Local Activities, 1951-1952.

PATTERSON, D. W.
Industrial Lighting Committee, 1950-1952.

PAULUS, A.
Chairman, Committee on Lighting Study Project in Steel Mills, 1950-1952; Section and Chapter Representatives of the Sustaining Membership Committee, 1951-1952.

PEAKE, T. T.
Chairman, Georgia Section, 1951-1952; Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

PEARSON, H. J. C.
Aviation Lighting Committee, 1950-1951; Sub-Committee on Taxiway Lighting and Sub-Committee on Compendium for Signal Lighting of the Aviation Lighting Committee, 1950-1951.

PEDERSON, C. B.
National Technical Conference Committee, 1951-1952; Vice-Chairman, Conference Executive Committee of the National Technical Conference Committee, 1951-1952; Chairman, Chicago Section, 1950-1951.

PECKHAM, CARLETON
Secretary, Central New York Section, 1951-1952.

PEEPLES, PHILIP
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

PEMBERTON, ERVIN H.
Local Representative, Pueblo, Colo., 1950-1951.

PENNOW, W. A.
Aviation Lighting Committee, 1950-1951; Sub-Committee on Airport Lighting of the Aviation Lighting Committee, 1950-1951.

PERKERSON, FRED S.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

PERKINS, E. J.
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951; Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

PERKINS, L. B.
Daylighting Committee, 1950-1952.

PERRY, MRS. BETH
Secretary, Northern California Section, 1951-1952.

PETCH, W. B.
Local Representative, Cheyenne, Wyoming, 1951-1952.

PHILLIPS, C. HARRY
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

PHILLIPS, H. E.
Local Representative, Johnson City, Tenn., 1950-1951.

PICKER, R. K.
Local Representative, Columbus, Ga., 1950-1951.

PIERCE, ORVAL W.
Local Representative, Adrian, Mich., 1950-1952.

PIERSON, LESLIE B.
Local Representative, Knoxville, Tenn., 1950-1952; Sub-Committee on Technical Data

Sheets of the Publications Committee, 1950-1951.

PIPPINGER, ROBERT H.
Section and Chapter Representative of the Membership Committee, 1951-1952.

PLANTE, BERNARD H.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1952.

PLOWMAN, BLAIR E.
Secretary, Inland Empire Chapter, 1950-1951.

POLLARD, THOMAS V.
Local Representative, Griffn, Ga., 1950-1951.

POPE, FLORENCE
Advisory Group from National Restaurant Association of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

POTTER, W. M.
Chairman, Committee on Lighting and Architecture, 1950-1952; Committee on Store Lighting, 1950-1952.

POWELL, CARL L.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

PREACHER, G. H.
Local Representative, Columbia, S. C., 1950-1951.

PRESBREY, PRISCILLA
Residence Lighting Committee, 1950-1952; Residence Lighting Forums Committee, 1950-1952; Committee on Standards of Quality and Quantity for Interior Illumination, 1950-1952; Nomenclature Committee, 1950-1952.

PRESTON, F. W.
Daylighting Committee, 1950-1952.

PRIDAY, GORDON
Local Representative, Jacksonville, Fla., 1950-1951.

PRIDEAUX, D. W.
Committee on National Technical Conference, 1950-1951.

PRIDEAUX, G. F.
Chairman, Committee on Mine Lighting, 1950-1951.

PRIESTER, G. B.
Committee on Lighting and Air Conditioning, 1951-1952.

PRIESTLEY, KENNETH
Local Representative, Bridgeport, Conn., 1950-1952.

PRUSSIA, R. S.
Sub-Committee on Lighting in the Canning Industry of the Committee on Lighting Study Projects in Industry, 1950-1952.

PUCKETT, EMORY L.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

PUTNAM, R. C.
School Lighting Committee, 1951-1952; Chairman, 1950-1951; Chairman, Task Committee on Conference with the National Council for School House Construction, 1950-1951; Representative American Standards Association Sectional Committee A23, 1950-1951.

Q

QUANE, ROBERT F.
Advisory Group from National Restaurant Association of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

QUERNEY, E. T.
Local Representative, Sudbury, Ont., 1950-1952; Committee on Mine Lighting, 1950-1952.

QUIPP, T. H.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

QUISENBERRY, S. W.
Daylighting Committee, 1950-1952; Committee on Lighting Maintenance, 1950-1952; Committee on Color and Illumination, 1950-1952.

R

RACINE, R. W.
Secretary, British Columbia Section, 1950-1952.

RADDIN, E. H.
Chairman, Committee on Light Sources, 1951-1952; Vice-Chairman, 1950-1951.

RAE, GENE G.
Store Lighting Committee, 1951-1952; Handbook Revision Committee, 1950-1952; Committee on Protective Lighting, 1950-1952.

RAHR, FREDERICK
Committee on Color and Illumination, 1951-1952.

RAINE, RUSSELL W.
Local Representative, Winter Park, Fla., 1950-1952.

RAMBUSCH, EDWARD
Chairman, Sub-Committee on Lighting in Auditoriums and Churches of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1951-1952; Member, 1950-1951; Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

RANDALL, W. C.
Daylighting Committee, 1950-1952; Representative, A.S.A. Sectional Committee A53, 1950-1952.

RANKIN, RUSSELL H.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951; Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

RAYMOND, RALPH G.
Chairman, Conference Executive Committee of the National Technical Conference Committee, 1951-1952; National Technical Conference Committee, 1951-1952.

RAYNER, WALTER P.
Sub-Committee on Lighting in the Textile Industry of the Committee on Lighting Study Projects in Industry, 1950-1952.

RAZAK, GLEN E.
Local Representative, Lawrence, Kan., 1950-1952.

REEDY, W. T.
Committee on Progress, 1950-1951.

REGAN, LEONARD R.
Local Representative, Great Falls, Mont., 1950-1951.

REID, KIRK M.
Committee on Street and Highway Lighting, 1950-1952; Coordinating Committee for Defense, 1950-1952; Committee on Lighting for Civil Defense, 1950-1952; Chairman, Sub-Committee on Research of the Committee on Street and Highway Lighting, 1950-1952; Executive Sub-Committee on Street and Highway Lighting, 1950-1952; Representative to National Engineering Advisory Committee, 1950-1952; Papers Committee, 1950-1951; Sub-Committee on Pavement Surfaces and Safety Lighting, Special Sub-Committee on Interchange with Foreign Groups, and Special Sub-Committee on Revision of 1927 Report "Principles of Street Lighting" of the Committee on Street and Highway Lighting.

REINAGEL, GEORGE
Secretary, Western New York Section, 1951-1952.

REINDL, FRANK R.
Local Representative, Bay St. Louis, Miss., 1950-1951.

REINHARDT, HARRIS
Nomenclature Committee, 1951-1952; Chairman, 1950-1951; Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952; Project Sub-Committee on Recommendations for Specific Areas of the Office Lighting Committee, 1950-1951; Representative, A.S.A. Sectional Committees C-42, Z10, Z14, Z32, and Z58, 1950-1951.

REIS, FRANK M.
Secretary, Oregon Section, 1950-1952.

RENY, J. ROMEO
Local Representative, Victoriaville, Quebec, Canada, 1951-1952.

REX, C. H.
Vice-Chairman, Committee on Street and Highway Lighting, 1951-1952; Secretary, 1950-1951; Secretary, Executive Sub-Committee on Street and Highway Lighting, 1950-1952; Chairman, Special Sub-Committee on Standard Practice of the Committee on Street and Highway Lighting, 1950-1951.

REYNOLDS, JANET S.
Chairman, Residence Lighting Forums Committee, 1950-1952; Residence Lighting Committee, 1950-1952; Sub-Committee on Home Lighting Data Sheets of the Publications Committee, 1950-1951.

RHEA, JOHN B.
Secretary, Pittsburgh Section, 1951-1952.

RHOADES, JOHN J.
Chairman, St. Louis Section, 1951-1952.

RICH, J. H.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952; Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

RICHARDS, R. R.
Committee on Mine Lighting, 1950-1952.

RICHARDS, WILLIAM
Sub-Committee on Lighting in Kitchens, Lunchrooms, Cafeterias and Dining Areas of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1951-1952.

RICHEY, E. B.
Local Representative, Birmingham, Ala., 1951-1952.

RICHARDSON, E. S.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

RIEGERT, L. J.
Chairman, Twin City Section, 1951-1952.

RIEGO, E. L.
Committee on Store Lighting, 1950-1952; Sub-Committee on Lighting in Kitchens, Lunchrooms, Cafeterias and Dining Areas of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1951.

RIPLEY, Y. L.
Residence Lighting Committee, 1951-1952.

ROBERTS, C. T.
Secretary, Maritime Chapter, 1951-1952; Local Representative, St. John, N. B., 1950-1952.

ROBERTS, L. L.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

ROBERTS, S. J.
Local Representative, St. Joseph, Mo., 1950-1952; Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

ROBINSON, EDWIN H.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

ROBINSON WILLIAM R.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

ROBY, CHAUNCEY W. B.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

RODGERS, ALSTON
Chairman, Progress Committee, 1950-1951.

ROGERS, ROLLAND W.
Local Representative, Pottsville, Pa., 1950-1952.

ROGGE, R. S.
Chairman, Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952; Committee on Lighting Maintenance, 1950-1952.

ROSCOE, G. B.
Committee on Public Relations and Information, 1951-1952.

ROMANS, GEORGE E.
Local Representative, Spokane, Wash., 1950-1951.

RONAYNE, JOHN
Committee on Public Relations and Information, 1950-1952.

ROPER, J. M.
Aviation Lighting Committee, 1950-1951; Sub-Committee on Aviation Lamps of the Aviation Lighting Committee, 1950-1951.

ROPER, VAL J.
Representative to Sub-Committee on Vehicle Lighting of the National Committee on Uniform Traffic Laws and Ordinances, 1950-1952; Aviation Lighting Committee, 1950-1951; Chairman, Sub-Committee on Aviation Lamps and Executive Sub-Committee of the Aviation Lighting Committee, 1950-1951.

RORBERG, C. E.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

ROSE, H. M.
Secretary, Southeast Florida Chapter, 1951-1952; Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

ROSENBERG, E. C.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

ROSS, HOWARD E.
Local Representative, Johnstown, Pa., 1950-1952.

ROSS, M. W.
Committee on Sports and Recreational Area Lighting, 1951-1952; Sub-Committee on Lighting in Kitchens, Lunchrooms, Cafeterias and Dining Areas of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

ROSSER, PHIL T.
Local Representative, Bellingham, Wash., 1950-1951.

ROTH, BENJAMIN F.
Sub-Committee on Lighting in the Textile Industry of the Committee on Lighting Study Projects in Industry, 1950-1952.

ROUGHLEY, TED
Sub-Committee on Lighting in Sheet Metal, Stamping, Folding and Shearing of the Committee on Lighting Study Projects in Industry, 1950-1952.

ROUGHTON, ALBERT G.
Local Representative, Albuquerque, New Mex., 1951-1952.

ROWTEN, DANA W.
Committee on Procedures and Policies, 1951-1952; Committee on Street and Highway Lighting, 1950-1952; Committee on Protective Lighting, 1950-1952; Committee on Testing Procedures for Illumination Characteristics, 1950-1952; Committee on Sports and Recreational Area Lighting, 1950-1952; Chairman, Sub-Committee on Program and Publicity and Executive Sub-Committee on Street and Highway Lighting, 1950-1952; Professional Requisites Committee, 1950-1951; Sub-Committee on Research, Sub-Committee on Study Assignments in Accident Surveys, Special Sub-Committee on Revision of 1927 Report "Principles of Street Lighting" and Special Sub-Committee on I.E.S. Lighting Handbook, of the Committee on Street and Highway Lighting, 1950-1951.

ROZIER, L. J.
Sub-Committee on Advertising Sales of the Publications Committee, 1950-1951.

RUBENSON, GEORGE C.
Local Representative, Elyria, Ohio, 1950-1952.

RUBIN, JOEL E.
Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

RUCKS, HAROLD E.
Local Representative, Dubuque, Iowa, 1951-1952.

RUDROW, R. G.
Project Sub-Committee on Recommendations for Specific Areas of the Office Lighting Committee, 1950-1951.

RUDY, ALLEN B.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

RUGGE, R. A.
Aviation Lighting Committee, 1950-1951; Chairman, sub-Committee on Aircraft Lighting of the Aviation Lighting Committee, 1950-1951; Sub-Committee on Aviation Lamps and Executive Sub-Committee of the Aviation Lighting Committee, 1950-1951.

RUSSELL, CHARLES C.
Local Representative, Lebanon, Pa., 1950-1952.

RUSSELL, JAMES M.
Local Representative Lithonia, Ga., 1951-1952.

RUTHERFOORD, J. PENN
Aviation Lighting Committee, 1950-1951.

RYDMAN, CARL E.
Sub-Committee on Lighting in the Textile Industry of the Committee on Lighting Study Projects in Industry, 1950-1952.

RYLANCE, J. H.
Secretary, Ottawa Chapter, 1950-1952.

S

SALISBURY, T. M.
Local Representative, Jackson, Miss., 1951-1952; Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

SALTER, E. H.
Chairman, New York Section, 1951-1952; Secretary, 1950-1951; Chairman, Committee on Lighting and Air Conditioning, 1950-1952; Committee on Light Sources, 1950-1952; Committee on Lighting Design Practice, 1950-1952; Sustaining Membership Committee, 1950-1951.

SALTER, MARGARET
Residence Lighting Forums Committee, 1950-1952.

SALTZ, L. W.
Sub-Committee on Lighting in Auditoriums and Churches of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1951-1952.

SAMPSON, FOSTER K.
Daylighting Committee, 1950-1952.

SANDERS, G. B.
Local Representative, Paducah, Ky., 1950-1951.

SANDERS, KERR
Residence Lighting Committee, 1951-1952.

SANDERS, J. J.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

SANDERS, W. W.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

SANDY, FRANK R.
Section and Chapter Representative of the Membership Committee, 1951-1952.

SANGSTER, ALFRED C.
Chairman, Michigan Section, 1951-1952; Secretary, 1950-1951; Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

SARGENT, T. C.
Chairman, Progress Committee, 1951-1952; Vice-Chairman, 1950-1951.

SAWYER, E. B.
Committee on Progress, 1950-1951.

SCHAENZER, JOSEPH
Committee on Farm Lighting, 1951-1952; Committee on Farm Buildings and Work Area Lighting, 1950-1951.

SCHAFER, ARTHUR V.
Section and Chapter Representative of the Membership Committee, 1951-1952.

SCHARR, FREEMAN C.
Chairman, Puget Sound Section, 1951-1952.

SCHIEWE, NORMAN A.
Local Representative, Vallejo, Calif., 1950-1951.

SCHLANGER, BEN
Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

SCHMITT, F. J.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

SCHRAUDT, GEORGE E., JR.
Local Representative, Richmond, Va., 1950-1952.

SCHRENK, L. J.
Chairman, Committee on Lighting for Civil Defense, 1951-1952; Co-Chairman, 1950-1951; Representative, President's Highway Safety Conference, 1950-1952; Committee on Street and Highway Lighting, 1950-1952; Sub-Committee on Pavement Surfaces and Safety Lighting, Sub-Committee on Study Assignments in Accident Surveys and Sub-Committee on Public Lighting and Traffic Safety of the Committee on Street and Highway Lighting, 1950-1951.

SCHUCHERT, J. S.
Director, 1951-1952; Regional Vice-President, 1950-1951; Chairman, Committee on Public Relations and Information, 1950-1952; Committee on Local Activities, 1950-1951; Committee on National Technical Conference, 1950-1951; Sub-Committee on Advertising Sales of the Publications Committee, 1950-1951.

SCHULTE, R. J.
Secretary, Ohio Valley Section, 1950-1951.

SCHULTZ, WALTER C.
Local Representative, Warren, Ohio, 1950-1952.

SCHUSLER, HARRY W.
Local Representative, Asheville, N. C., 1950-1952.

SCHWALM, E. E.
Chairman, Cornhusker Chapter, 1951-1952; Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

SCHWANHAUSSER, W. E., JR.
Secretary, New England Section, 1951-1952.

SCOTT, H. P.
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

SCOTT, R. G.
Chairman, Committee on Lighting for Civil Defense, 1951-1952; Task Committee on Lighting for Civilian Defense, 1950-1951.

SEAGERS, PAUL
Chairman, Sub-Committee on Visual Problems of the Committee on School Lighting, 1950-1951.

SEAQUIST, C. L.
Local Representative, La Crosse, Wis., 1950-1952.

SEBURN, T. J.
Committee on Street and Highway Lighting, 1950-1952; Sub-Committee on Coordination and Sub-Committee on Public Lighting and Traffic Safety of the Committee on Street and Highway Lighting, 1950-1951.

SEGALL, B. Z.
Chairman, New Orleans Section, 1950-1951.

SEITER, G. H.
Chairman, Ohio Valley Section, 1951-1952.

SEITZ, R. J.
Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

SELBY, C. J.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

SELL, FLOYD W.
Chairman, Sub-Committee on Lighting in Sheet Metal, Stamping, Folding and Shearing of the Committee on Lighting Study Projects in Industry, 1950-1952; Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

SELLMAN, HUNTON D.
Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

SHAFER, WILLIAM
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

SHAFFER, THOMAS E.
Sub-Committee on Student Vision and Scholarship of the Committee on School Lighting, 1950-1951.

SHARP, H. M.
Committee on Lighting and Air Conditioning, 1950-1952; Chairman, Board of Fellows, 1950-1951; Sub-Committee on Editorial Content of the Publications Committee, 1950-1951.

SHARP, J. VERNON
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

SHAW, W. A.
Committee on Street and Highway Lighting, 1950-1952; Sub-Committee on Public Lighting and Traffic Safety, and Sub-Committee on Pavement Surfaces and Safety Lighting of the Committee on Street and Highway Lighting, 1950-1951.

SHAW, WAYNE L.
Chairman, Utah Chapter, 1951-1952.

SHEETER, H. X.
Sustaining Membership Committee, 1950-1951; Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

SHENK, WILLIAM B.
Chairman, Florida Chapter, 1950-1951.

SHEPHERD, T. H.
Office Lighting Committee, 1950-1952; Committee on Lighting for Civil Defense, 1951-1952; Sub-Committee on Editorial Content of the Publications Committee, 1950-1951.

SHOEMAKER, G. E.
Official Representative to the Industry Committee in Connection with the Revision of "Handbook of Interior Wiring Design," 1950-1952; Representative, A.S.A. Sectional Committee C1, 1950-1952; Committee on Store Lighting, 1950-1951.

SHOTWELL, C. C.
Chairman, Sustaining Membership Committee, 1950-1952; Industrial Lighting Committee, 1950-1952; Nomenclature Committee, 1950-1952; Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952; Committee on Public Relations and Information, 1951-1952; Sub-Committee on Advertising Sales of the Publications Committee, 1950-1951; Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

SHUTE, J. M.
Vice-Chairman, Committee on Lighting Study Project in the Textile Industry, 1951-1952; Member, 1950-1951.

SILVA, J. G.
Secretary, Mexico Chapter, 1950-1952.

SIMONSEN, S. H.
Chairman, Southern California Section, 1951-1952.

SIMPSON, L. C.
Aviation Lighting Committee, 1950-1951; Sub-Committee on Compendium for Signal Lighting of the Aviation Lighting Committee, 1950-1951.

SIMPSON, R. E.
Committee on Street and Highway Lighting, 1950-1951; Sub-Committee on Public Lighting and Traffic Safety of the Committee on Street and Highway Lighting, 1950-1951.

SINGER, CHARLES
Committee on Lighting for Television Production, 1951-1952.

SINGLETON, F. E.
Sub-Committee on Lighting in the Textile Industry of the Committee on Lighting Study Projects in Industry, 1950-1952.

SLATER, A. C.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

SLAUER, R. G.
Vice-President, Northeastern Region, 1950-1952; Chairman, Membership Committee, 1951-1952; Regional Chairman, 1950-1951; Committee on Street and Highway Lighting, 1950-1952; Committee on Local Activities, 1951-1952; Committee on Public Relations and Information, 1951-1952; National Technical Conference Committee, 1951-1952; Executive Sub-Committee of the Committee on Street and Highway Lighting, 1951-1952; Chairman, Sub-Committee on Low Level Lighting of the Committee on Street and Highway Lighting, 1951-1952; Publications Committee, 1950-1951; Sub-Committee on Research, Special Sub-Committee on Interchange with Foreign Groups, and Special Sub-Committee on I.E.S. Lighting Handbook of the Committee on Street and Highway Lighting, 1950-1951.

SLUSSER, LEONARD M.
Section and Chapter Representative of the Membership Committee, 1951-1952.

SLY, R. M.
Local Representative, Evansville, Ind., 1950-1952.

SMART, R. M.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

SMEDBERG, GEORGE
Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

SMITH, A. M.
Local Representative, Lafayette, Ind., 1950-1951.

SMITH, C. E.
Secretary, Alamo Chapter, 1951-1952.

SMITH, C. H.
Local Representative, Sandusky, Ohio, 1950-1952.

SMITH, FLOYD F.
Local Representative, Raleigh, N. C., 1950-1951.

SMITH, J. C.
Committee on Mine Lighting, 1950-1952.

SMITH, J. R.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

SMITH, R. H.
Secretary, Mississippi Chapter, 1951-1952.

SMITH, ORLO L.
Local Representative, Mansfield, Ohio, 1950-1952.

SMITH, S. C.
Chairman, British Columbia Section, 1950-1951.

SMITH, WALTER S., JR.
Local Representative, Augusta, Ga., 1950-1952.

SMOLEY, N. G.
Local Representative, Ft. Wayne, Ind., 1950-1952.

SMYTHE, R. L.
Committee on Testing Procedures for Illumination Characteristics, 1950-1952.

SOBOLIK, A. A.
Section and Chapter Representative of the Membership Committee, 1951-1952; Sub-Committee on Lighting in Laundries of the Committee on Lighting Study Projects in Industry, 1950-1952; Joint Sub-Committee, I.E.S. - U. S. Public Health Committee, 1950-1951.

SOHN, HOWARD
Committee on Lighting Design Practice, 1950-1952.

SOLANDT, DONALD Y.
Committee on Standards of Quality and Quantity for Interior Illumination, 1950-1952; Research Committee, 1950-1951.

SOLLEY, GLEASON E.
Local Representative, Williamsport, Pa., 1950-1952.

SOUTHERLIN, W. B.
Local Representative, Columbia, S. C., 1951-1952.

SPANGLER, B. E.
Local Representative, Findlay, Ohio, 1951-1952.

SPECK, WILLIAM R.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

SPENCER, D. E.
Committee on Standards of Quality and Quantity for Interior Illumination, 1950-1952; Daylighting Committee, 1950-1952; Committee on Color and Illumination, 1950-1952.

SPERRY, C. J.
Sub-Committee on Artificial Moonlight Project of the Coordinating Committee for Defense, 1951-1952.

SPRANKLE, C. N.
Committee on Light Control and Equipment Design, 1950-1952.

SPRINGER, D. A.
Local Representative, Anniston, Ala., 1951-1952.

STAAL, R. W.
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

STAEHLE, DANIEL
Sub-Committee on Lighting in Theatres of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

STAFFORD, H. E.
Local Representative, Port Arthur, Ont., 1950-1952; Committee on Lighting for Civil Defense, 1951-1952; Task Committee on Lighting for Civilian Defense, 1950-1951.

STAIR, J. L.
Board of Fellows, 1950-1952; Medal Award Committee, 1950-1952.

STAPLES, C. L.
Advisory Group from National Restaurant Association of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

STAUD, R. W.
Chairman, Board of Nomination, 1950-1951; Chairman, Task Committee on Advance Planning, 1950-1951; Medal Award Committee, 1950-1951; Research Fund Committee, 1950-1951; Publications Committee, 1950-1951; Procedures and Policies Committee, 1950-1951; Representative to U. S. National Committee of the International Commission on Illumination, 1950-1951; Chairman, Sub-Committee on Advertising Sales of the Publications Committee, 1950-1951.

STAUDER, L. F.
Local Representative, South Bend, Ind., 1950-1952.

STEDMAN, J. M.
Vice-Chairman, Publications Committee, 1950-1952; Chairman, Sub-Committee on Advertising Sales of the Publications Committee, 1951-1952.

STEELE, HOYT P.
Chairman, National Technical Conference Committee, 1951-1952; Vice-Chairman, 1950-1951; Technical Committee Forum, 1951-1952; Constitution and By-Laws, 1951-1952; Procedures and Policies Committee, 1951-1952; Nomenclature Committee, 1950-1952; Industrial Lighting Committee, 1950-1952; Representative, A.S.A. Sectional Committee C1, 1950-1952; Director, 1950-1951; Chairman, Papers Committee, 1950-1951; Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

STEENBERG, R. W.
Advisory Group from National Restaurant Association of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

STEFANY, R. J.
Aviation Lighting Committee, 1950-1951; Sub-Committee on Papers and Sub-Committee on Definitions and Terms of the Aviation Lighting Committee, 1950-1951.

STEINER, J. W.
Industrial Lighting Committee, 1950-1952; Progress Committee, 1950-1952; Sub-Committee on Lighting in Foundries of the Committee on Lighting Study Projects in Industry, 1950-1952.

STEITZ, ALLAN A.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952; Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

STELLY, J. A.
Local Representative, Baton Rouge, La., 1950-1951.

STEPHEN, J. D.
Committee on Public Relations and Information, 1950-1951.

STEPHENS, C. B.
Committee on Lighting of Central Station Properties, 1950-1952.

STEWART, FREDERICK A.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

STICKNEY, GEORGE H.
Historical Committee, 1950-1952; Representative to U. S. National Committee of the International Commission on Illumination, 1950-1952.

STILES, K. I.
Local Representative, Moncton, N. B., Canada, 1951-1952.

STOCKEL, IVAR H.
Chairman, Michigan Section, 1950-1951.

STONE, CHESTER P.
Chairman, Iowa Section, 1951-1952.

STRONG, E. M.
Vice-President, 1950-1952; Council Executive Committee, 1950-1952; Chairman, Technical Forum, 1951-1952; Vice-Chairman, 1950-1951; Chairman, Advisory Board on Committee Personnel, 1951-1952; Committee on Standards of Quality and Quantity for Interior Illumination, 1950-1952; Task Committee on Advance Planning, 1950-1952; Representative to National Research Council, Division of Engineering and Industrial Research, 1950-1952; Chairman, Committee on Local Activities, 1950-1951; Chairman, Task Committee — Joint I.E.S. - A.P.H.A. Committee, 1950-1951; Professional Requisites Committee, 1950-1951; Research Committee, 1950-1951; Task Committee to Study Possible Change in I.E.S. Fiscal Year, 1950-1951.

STROUD, H. A.
Committee on Lighting Education, 1950-1952; School Lighting Committee, 1951-1952.

STUART, W. T.
Committee on Public Relations and Information, 1950-1951.

STURROCK, WALTER
Past President, 1951-1952; President, 1950-1951; Constitution and By-Laws, 1951-1952; Advisory Board on Committee Personnel, 1951-1952; Board of Nomination Committee, 1951-1952; Medal Award Committee, 1951-1952; Trustee, I.E.S. Retirement Pension Plan, 1951-1952; Representative to U. S. National Committee of the International Commission on Illumination, 1950-1952; Chairman, Council Executive Committee, 1950-1951; Representative, President's Highway Safety Conference Committee on Organized Public Support, 1950-1951.

SWACKHAMER, R. J.
Chairman, Committee on Sports and Recreational Area Lighting, 1950-1952.

SWARNER, J. L.
Committee on Public Conveyances — Interior Lighting, 1950-1952.

SWEATTE, J. E.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

SWETLAND, R. M.
Committee on Street and Highway Lighting, 1950-1952; Executive Sub-Committee, and Chairman, Sub-Committee on Tunnel and Underpass Lighting of the Committee on Street and Highway Lighting, 1951-1952; Chairman, Sub-Committee on Editing of Standard Practice for Street and Highway Report of the Committee on Street and Highway Lighting, 1951-1952; Special Sub-Committee on I.E.S. Lighting Handbook of the Committee on Street and Highway Lighting, 1950-1951; Sub-Committee on Program and Publicity and Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

T

TABER, E. T.
Chairman, Cornhusker Chapter, 1950-1951.

TAEPKE, MARY
Residence Lighting Forums Committee, 1950-1952; Sub-Committee on Home Lighting Data Sheets of the Publications Committee, 1950-1951.

TAGG, J. E.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

TALBOT, ARTHUR L.
Local Representative, Trenton, N. J., 1950-1952.

TAME, T. A.
Local Representative, Windsor, Ont., 1950-1952.

TATE, W. H.
Local Representative, Calgary, Alberta, Canada, 1951-1952.

TAYLER, LEE E.
Chairman, Board of Nomination Committee, 1951-1952; Member, 1950-1951; Medal Award Committee, 1950-1952; Procedures and Policies Committee, 1950-1952; Historical Committee, 1950-1952; Chairman, Committee on Lighting Service, 1951-1952; Committee on National Technical Conference, 1950-1952; Committee on Lighting of Central Station Properties, 1951-1952; Chairman, Research Fund Committee, 1950-1951; Professional Requisites Committee, 1950-1951; Advisory Board on Committee Personnel, 1950-1951.

TAYLOR, A. S.
Progress Committee, 1951-1952.

TAYLOR, D. W.
Committee on Lighting of Central Station Properties, 1950-1952.

TAYLOR, GEORGE J.
Finance Committee, 1950-1952; Progress Committee, 1950-1952; Office Lighting Committee, 1950-1952; Representative, A.S.A. Sub-Committee X2, 1950-1952; Sustaining Membership Committee, 1950-1951; Sub-Committee on Advertising Sales of the Publication Committee, 1950-1951; Project Sub-Committee on Task Evaluation and Project Sub-Committee on Depreciation and Maintenance of the Office Lighting Committee, 1950-1951.

TAYLOR, WILLIAM B.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

TEELE, RAY P.
Chairman, Capital Section, 1951-1952; Chairman, Committee on Illumination Performance Recommendations, 1950-1952; Committee on Lighting Maintenance, 1950-1952; Committee on Testing Procedure for Illumination Characteristics, 1950-1952; Representative to Sub-Committee on Vehicle Lighting of the National Committee on Uniform Traffic Laws and Ordinances, 1950-1952; Sub-Committee of Lighting Advisors for the East Coast of the Committee on Lighting for Civil Defense, 1951-1952; Technical Committee Forum, 1950-1951; Conference Executive Sub-Committee of the Committee on National Technical Conference, 1950-1951.

TERRILL, J. D.
Local Representative, Mobile, Ala., 1950-1952.

THALLON, ROBERT
Sub-Committee on Lighting in the Canning Industry of the Committee on Lighting Study Projects in Industry, 1950-1952.

THATCHER, S. D.
Local Representative, Topeka, Kan., 1950-1952.

THEISNER, WILLIAM G.
Section and Chapter Representative of the Membership Committee, 1951-1952.

THERIAULT, J. DENIS
Section and Chapter Representative of the Membership Committee, 1951-1952; Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

THOMAS, B. A.
Vice-Chairman, Project Committee on Characteristics of Office Materials and Equipment and Related Environmental Factors of the Committee on Office Lighting, 1950-1951.

THOMAS, GEORGE W.
Daylighting Committee, 1950-1952.

THOMAS, H. S.
Section and Chapter Representative of the Membership Committee, 1951-1952; Chairman, Mississippi Chapter, 1950-1951.

THOMAS, JESS D.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

THOMAS, J. RICHARD
Local Representative, Portsmouth, Ohio, 1950-1951.

THOMAS, JOSEPH
Regional Chairman, Committee on Membership, 1950-1951.

THOMAS, ORPHA M.
Residence Lighting Committee, 1950-1952

THOMETZ, WALLACE
Local Representative, St. Cloud, Minn., 1951-1952.

THORNE, P. B.
Chairman, Philadelphia Section, 1951-1952.

THORPE, D. A.
Local Representative, Saskatoon, Sask., Canada, 1951-1952.

THUNEN, ROBERT W.
Secretary, Northern California Section, 1950-1951.

TICEHURST, NORMAN E.
Secretary, New England Section, 1950-1951.

TIMMONS, RICHARD M.
Sub-Committee on Marine Lighting of the Committee on Public Conveyances — Interior Lighting, 1951-1952.

TINDAL, NORMAN E.
Chairman, Carolinas Chapter, 1951-1952; Secretary, 1950-1951.

TINKER, MILES A.
Research Committee, 1950-1951.

TOLMAN, C. P.
Sub-Committee on Student Vision and Scholarship of the Committee on School Lighting, 1950-1951.

TOLY, WALTER
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

TOUSEY, RICHARD
Sub-Committee on Compendium for Signal Lighting of the Aviation Lighting Committee, 1950-1951.

TOWNER, L. W.
Committee on Public Relations and Information, 1950-1951.

TOWNSEND, RICHARD F.
Lighting Maintenance Committee, 1951-1952.

TRACHT, R. R.
Sub-Committee on Student Vision and Scholarship of the Committee on School Lighting, 1950-1951.

TRAPANI, UMBERTO L.
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

TREFREY, D. E.
Committee on Sports and Recreational Area Lighting, 1950-1952; Vice-Chairman, Professional Requisites Committee, 1950-1951.

TRIMBLE, LOREN
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

TROSPER, G. A.
Committee on Street and Highway Lighting, 1950-1952; Sub-Committee on Public Lighting and Traffic Safety, Sub-Committee on Pavement Surfaces and Safety Lighting, and Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

TROTTER, GEORGE S.
Chairman, San Jacinto Section, 1951-1952.

TROY, C. T.
Local Representative, Towanda, Pa., 1950-1952.

TUCK, D. H.
Aviation Lighting Committee, 1950-1951.

TUCKER, W. T.
Local Representative, Rome, Ga., 1951-1952.

TUGMAN, J. L.
Handbook Revision Committee, 1950-1952.

TURNER, A. S., JR.
National Technical Conference Committee, 1951-1952.

TWITCHELL, L. C.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

TYLOR, A. S.
Progress Committee, 1950-1951.

TYSINGER, PAUL T.
Local Representative, Spartanburg, S. C., 1950-1952.

V

VACHA, NORMAN
Vice-Chairman, Residence Lighting Committee, 1950-1952.

VANDERVELDE, A.
Sub-Committee on Marine Lighting of the Committee on Public Conveyances — Interior Lighting, 1951-1952.

VANNEMAN, JAMES L.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

VARNER, DON F.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

VEZEY, E. E.
Daylighting Committee, 1950-1952.

VILES, N. E.
Sub-Committee on Visual Problems of the Committee on School Lighting, 1950-1951.

VINCENT, D. H.
Secretary, Rochester Chapter, 1951-1952.

VINCENT, H. B.
Daylighting Committee, 1950-1952.

VIPOND, L. C.
Aviation Lighting Committee, 1950-1951; Chairman, Sub-Committee on Airport Lighting of the Aviation Lighting Committee, 1950-1951; Executive Sub-Committee of the Aviation Lighting Committee, 1950-1951.

VOELKER, JACK
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

VOGEL, A.
Daylighting Committee, 1950-1952.

VOLK, W. N.
Sub-Committee on Pavement Surfaces and Safety Lighting of the Committee on Street and Highway Lighting, 1950-1951.

VOLLRATH, CHARLES W.
Local Representative, Tacoma, Wash., 1950-1951.

VON BURG, A. J.
Committee on Farm Lighting, 1951-1952; Committee on Farm Buildings and Work Area Lighting, 1950-1951.

VORLANDER, F. J.
Chairman, New England Section, 1951-1952; Secretary, Committee on Lighting in the Textile Industry of the Committee on Lighting Study Projects in Industry, 1951-1952; Member, 1950-1951.

VOSS, EDWIN H.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

W

WADE, WILLIAM C.
Local Representative, Morgantown, W. Va., 1950-1952.

WAGNER, J. E.
Local Representative, Stroudsburg, Pa., 1950-1952.

WAITE, ROGER T.
Office Lighting Committee, 1950-1952.

WAKEFIELD, A. F.
Official Representative to National Research Council, National Academy of Sciences, 1950-1952.

WAKEFIELD, G. P.
Office Lighting Committee, 1951-1952; Chairman, 1950-1951; Lighting Maintenance Committee, 1950-1952; Committee on Illumination Performance Recommendations, 1950-1952; Chairman, Project Sub-Committee on Depreciation and Maintenance of Office Lighting Systems of the Office Lighting Committee, 1950-1951.

WAKEFIELD, T. D.
Sub-Committee on Editorial Content of the Publications Committee, 1950-1951; Sub-Committee on Advertising Sales of the Publications Committee, 1950-1951.

WALDEN, J. G. L.
Sub-Committee on Lighting in Hospitals of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

WALDRAM, J. M.
Editorial Board of Sub-Committee on Compendium for Signal Lighting of the Aviation Lighting Committee, 1950-1951.

WALDRON, C. E.
Local Representative, Albany, N. Y., 1950-1952; Sub-Committee on Study Assignments in Accident Surveys of the Committee on Street and Highway Lighting, 1950-1951.

WALKER, J. E. L.
Secretary, Hamilton, Ontario Chapter, 1950-1951.

WALLACE, LELAND M., JR.
Secretary, St. Louis Section, 1951-1952.

WALSH, JOHN S.
Secretary, Committee on Lighting for Civil Defense, 1951-1952 Member, 1950-1951; Coordinating Committee for Defense, 1950-1952; Medal Award Committee, 1950-1952; Sub-Committee on Brightness Conditions in Educational Environments of the Committee on School Lighting, 1950-1951.

WALTER, GEORGE F.
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

WALTERS, ALBERT H.
Sub-Committee on Technical Data Sheets of the Publications Committee, 1950-1951.

WALTERS, F. S.
Conference Executive Sub-Committee of the Committee on National Technical Conference, 1950-1951; Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

WALTERS, FRANK
Chairman, Sub-Committee on Lighting for Cleaning and Dyeing Industry of the Committee on Lighting Study Projects in Industry, 1950-1951.

WALTER, GEORGE F.
Section and Chapter Representative of the Membership Committee, 1951-1952.

WALTON, JOHN B.
Local Representative, Griffin, Ga., 1951-1952.

WARING, MALCOLM
Committee on Lighting for Television Production, 1951-1952.

WARNER, G. K.
Secretary, Cleveland Section, 1950-1951.

WARNER, JAMES P.
Project Sub-Committee on Performance of Lighting Systems of the Committee on Office Lighting, 1950-1951.

WARNER, NELSON C.
Chairman, Pittsburgh Section, 1951-1952.

WARNER, STANLEY
Residence Lighting Committee, 1950-1952.

WARSKOW, MARTIN A.
Aviation Lighting Committee, 1950-1951; Chairman, Sub-Committee on Taxiway Lighting, Executive Sub-Committee and Sub-Committee on Compendium for Signal Lighting of the Aviation Lighting Committee, 1950-1951.

WASHAM, FRANK O.
Advisory Group from National Restaurant Association of the Committee on Lighting Study Projects in Public Buildings and Private Institutions, 1950-1952.

WATERMAN, MARSHALL N.
Secretary, New York Section, 1951-1952; Committee on Constitution and By-Laws, 1951-1952; Trustee, I.E.S. Retirement Pension Plan, 1951-1952; Chairman, Finance Committee, 1950-1952; Handbook Revision Committee, 1950-1952; Industrial Lighting Committee, 1950-1952; Coordinating Committee for Defense, 1950-1952; Task Committee on Advance Planning, 1950-1952; Committee on National Technical Conference, 1950-1952; Representative to U. S. National Committee of the International Commission on Illumination, 1950-1952; Task Committee to Study Possible Change in I.E.S. Fiscal Year, 1950-1951.

WATERS, R. R., JR.
Local Representative, Savannah, Ga., 1950-1951.

WATKINS, GEORGE B.
Daylighting Committee, 1950-1951.

WATKINS, J. E.
Sub-Committee on Lighting in the Textile Industry of the Committee on Lighting Study Projects in Industry, 1950-1952.

WATKINS, J. F.
Committee on Lighting and Architecture, 1950-1952.

WATKINS, LEIGH, III
Secretary, Mississippi Chapter, 1951-1952.

WATT, R. F.
Local Representative, Wentachee, Wash., 1950-1951.

WATTERS, GEORGE A.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

WATTERS, G. W.
Committee on Public Relations and Information, 1950-1951.

WEATHERBEE, P. E.
Local Representative, Portland, Maine, 1951-1952.

WEBB, D. ROLLAND
Section and Chapter Representative of the Membership Committee, 1951-1952.

WEBBER, MARY E.
Chairman, Residence Lighting Committee, 1950-1952.

WEBSTER, J. DANIEL
Publicity Chairman, Sub-Committee of Committee on Public Relations and Information, 1950-1951.

WEEKS, A. W.
Committee on Testing Procedures for Illumination Characteristics, 1950-1951.

WEERS, ARTHUR F.
Secretary, Rocky Mountain Section, 1951-1952.

WEIBEL, HAROLD R.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

WEIBEL, W. A.
Secretary, Chicago Section, 1950-1951.

WEIDMAN, HARRY T.
Local Representative, Shenandoah, Pa., 1950-1952.

WEIGHTMAN, LEONARD
Sub-Committee of Section and Chapter Representatives of the Membership Committee, 1950-1951.

WEIR, JOHN M.
Chairman, Heart of America Section, 1950-1951.

WEITZ, C. E.
Chairman, Committee on Lighting Education, 1950-1952; Sustaining Membership Committee, 1950-1951; Sub-Committee on Brightness Conditions in Educational Environments of the Committee on School Lighting, 1950-1951.

WELCH, K. C.
Committee on Store Lighting, 1950-1952; Daylighting Committee, 1950-1952; Committee on Color and Illumination, 1950-1952.

WELCH, J. W.
Local Representative, Greensboro, N. C., 1950-1952.

WELCH, ROBERT J.
Section and Chapter Representative of the Membership Committee, 1951-1952.

WELLS, CHARLES
Local Representative, Joplin, Mo., 1950-1952.

WELLS, GORDON
Local Representative, Charlotte, N. C., 1950-1951.

WENZLER, O. F.
Daylighting Committee, 1951-1952.

WEST, FRED R.
Local Representative, New Haven, Conn., 1950-1952.

WETHERBEE, P. E.
Local Representative, Portland, Me., 1950-1951.

WHALEN, THOMAS J.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

WHEELER, W. C.
Committee on Public Conveyances — Interior Lighting, 1950-1952.

WHITE, DARCIE H.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

WHITE, D. C.
Committee on Lighting Education, 1950-1952; Sub-Committee on Lighting in the Canning Industry of the Committee on Lighting Study Projects in Industry, 1950-1952.

WHITE, EDWARD R.
Section and Chapter Representative of the Committee on Public Relations and Information, 1951-1952.

WHITE, W. F.
Local Representative, Clyde, Ohio, 1951-1952.

WHITEHEAD, J. F., JR.
Task Committee on Advance Planning, 1951-1952.

WHITMORE, CLIFTON W.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

WHITNEY, FRANCIS J.
Sub-Committee of Section and Chapter Representatives of the Sustaining Membership Committee, 1950-1951.

WHITNEY, J. FRANCIS
Local Representative, Eugene, Ore., 1950-1951.

WICKETT, J. M.
Section and Chapter Representative of the Sustaining Membership Committee, 1951-1952.

WICKHAM, A. O.
Local Representative, Hollywood, Fla., 1951-1952.

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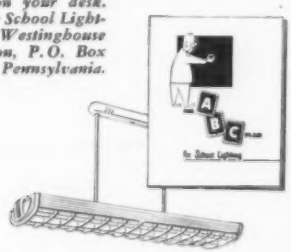

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ILLUMINATING ENGINEERING

THE JOURNAL OF THE ILLUMINATING ENGINEERING SOCIETY

JANUARY
1951

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No. 1

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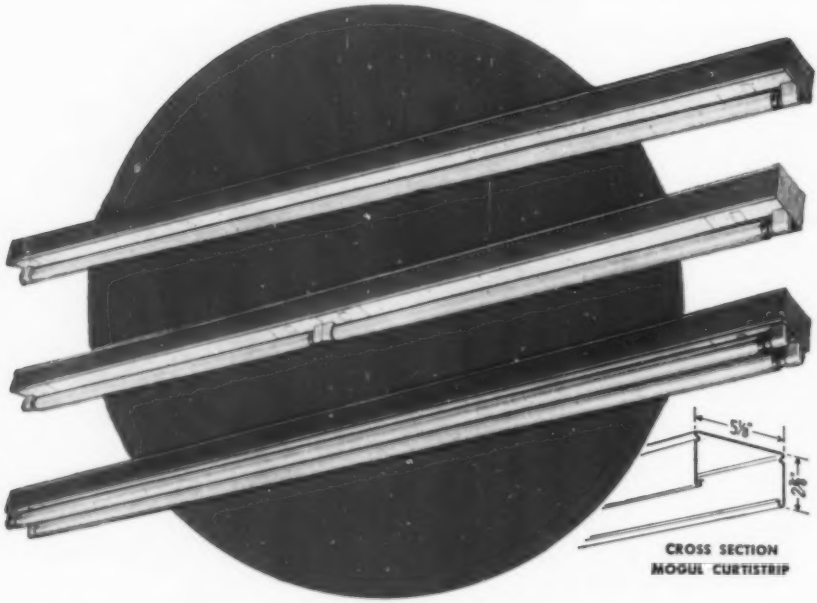

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Parade of Lighting Progress

Report of I.E.S. Committee on Progress—1949-1950

ALSTON RODGERS, Chairman

THIS has been a good year in lighting. The newer light sources and well-designed equipment have become much more readily available although not yet in entirely free supply. New and improved installations everywhere evidence the growing appetite for the comforts and advantages brought by the better things in light. Lighting knowledge and techniques have advanced steadily in wide and varied fields.

In this report we have attempted to select and record items of interest in the year's parade of lighting progress. Some of these developments will prove to be of major significance. Many others mark the present state of the art and science or point the trend in practice, while a few examples have been included because of their unique or unusual character:

Statistics and Predictions

One important indication of lighting progress may be found in the growth of the lighting fixture business. The 1947 U. S. Census of Manufactures, reported by the Department of Commerce late in 1949, gave the lighting fixture industry its first statistical check-up since 1939.

As the 1939 Census was admittedly somewhat incomplete, the last comprehensive figures were those of the 1937 Census which reported lighting fixture manufacturers' net sales totaling $112,920,000. Of this amount $96,945,000 represented electric lighting fixtures, and $15,975,000 was for kerosene lamps and lanterns, gas mantles and other non-electric lighting devices.

The 1947 Census, reporting on the industry ten years later, shows a total fixture sales of $479,260,000; electric fixtures $469,052,000, non-electric devices $10,208,000. This latter figure does not include the ten to twelve million dollars spent yearly for candles.

Fig. 1 gives a graphical analysis of the 1947 lighting fixture business in round figures. Although these data are already two years behind what goes on today, they give us our first real benchmark for surveying the fixture industry since the advent of the fluorescent lamp and other important developments.

Another measuring stick for lighting progress is the amount of electrical energy used for lighting.

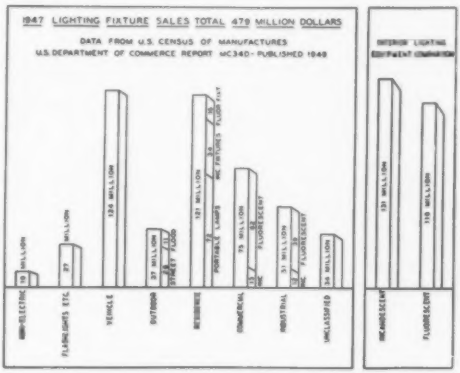


Figure 1. Lighting fixture sales chart.

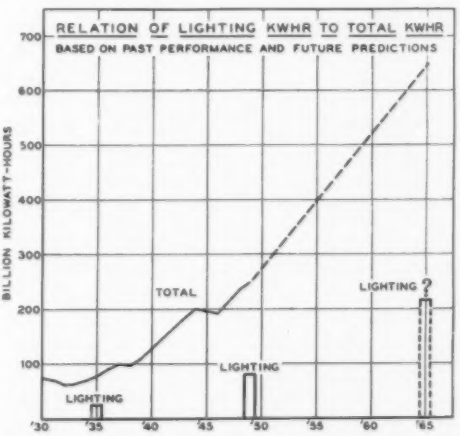
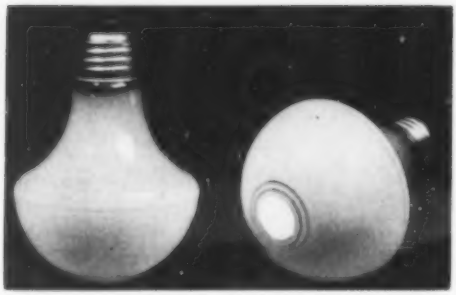


Figure 2. Relation of electric energy used for lighting to total electric consumption.

A report presented at the National Technical Conference of the Illuminating Engineering Society, August 21-24, 1950, Pasadena, California. Committee on Progress, 1949-1950: Chairman, Alston Rodgers; T. Sargent; A. C. Barr; E. W. Beggs; M. H. Bigelow; O. P. Cleaver; Paul D. Cornelisen; J. M. Howard; Walter J. Jones; Arthur P. Larsou; E. A. Linsday; J. A. Meacham; J. W. Stiener; A. S. Tylor. Approved by the I.E.S. Council, October 1950.



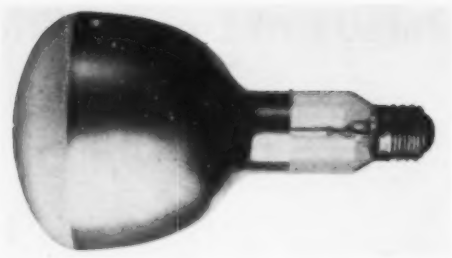


Figure 3. Some new forms in lamp bulbs:

3a (Top left). 50GA semi-indirect lamp for residential bare-lamp ceiling luminaires.

3b (Top right). R-52 reflector lamp bulb for lighting high bay industrial areas where maintenance is difficult.

3c (Right). J-H1 fluorescent-mercury lamp in BT-37 bulb for industrial, street and floodlighting applications.

Reliable estimates of lighting kilowatt-hours used in 1935 and 1949 are shown in Fig. 2 related to a recently published graph of total yearly kilowatt-hours sales for all purposes in this country. This graph shows that total energy sales have increased from about 75 billion kilowatt-hours in 1930 and 1935 to nearly 250 billion in 1949 and predicts a steady rise reaching about 650 billion kilowatt-hours by 1965. Another even more optimistic forecast visualizes a trillion kilowatt-hours by 1970!

The estimates of electrical energy for lighting (based on analyses of lamp sales) indicate that lighting kilowatt-hours accounted for about one-third of total kilowatt-hours in both 1935 and 1949. If the predicted increases in electrical demand are realized and if advancements in lighting can keep pace with the rest of the industry, this will mean that fifteen years hence more than 200 billion kilowatt-hours will be used for lighting compared to about 80 billion kilowatt-hours last year.

Light Sources

Incandescent Lamps

A unique and effective new bulb shape has been introduced by one lamp manufacturer in a semi-indirect-lighting 50GA lamp (Fig. 3a) designed for use in the multitude of existing residential bare-lamp ceiling fixtures and rosettes. This "lamp bulb with the built-in shade" offers improved appearance and soft comfortable illumination in useful quantities. The bowl-shaped portion of the 50-watt inside-frosted bulb is enameled in a warm tint with clear rings in the enameling and a clear circle at the bottom for decoration and sparkle.

During the year, a practical method was developed for solving the difficult problem of lightly inside-frosting a hard-glass reflector bulb, and a 300-watt R-40 hard-glass reflector spot lamp has been made available for the first time. Its narrower more intense beam provides for longer throws or more concentrated spotlighting than its companion outdoor reflector flood lamp.

One concern has announced 1000-watt and 750-watt reflector flood lamps in an R-60 bulb with a contour similar to that of the familiar R-40 bulb.

A new large reflector lamp bulb of specially designed shape (Fig. 3b) has been placed on the market for lighting high bay industrial areas where maintenance i sa major problem due to rapid dirt accumulation. The reflector contour is such that the beam is rather widespread (approximately 90 degrees), but the cut-off is so sharp that the utilization is in the "focusing" class and brightness in the shielded zone (approximately 55 degrees) is relatively comfortable. These R-52 lamps are available in 500-watt and 750-watt sizes.

Last year the first standard-voltage sealed beam type spot lamp with really concentrated beam was announced for commercial use. This 200-watt PAR-46 narrow beam lamp with side prong base provides a maximum beam candlepower of 50,000. Recently an even more powerful spot lamp with a

100,000 candlepower beam has been added to the line. This is a 300-watt PAR-56 lamp with a mogul end prong base. Both lamps are designed for applications requiring a spot of high intensity; where high footcandle levels are desired for instance, or for the longer throws from high ceilings and for those outdoor uses where a narrow beam is needed. Already the 200-watt size is being used for brilliant spotlighting in show windows.

One company reports a significant improvement in its standard 300-watt T-10 projection lamps used widely in miniature slide and home movie projectors. By changing the filament construction from the former two-segment coiled-coil to a mechanically-formed single-coiled monoplane type, it is stated that an increase of 10 per cent to 25 per cent in screen illumination is obtained, and a mechanically stronger lamp of even more uniform performance results.

A line of street lighting lamps with clear, "weather-resistant" bulb coating has been placed on the market. Its manufacturer states that users have reported up to 75 per cent reductions in premature bulb failures due to water seepage, rain, fog and condensation.

The 1950 holiday season will see the introduction of small C-7½ candelabra base, multiple burning Christmas tree lamps especially made for outdoor as well as indoor use. Some of these decorative lamps are being produced with colored enamel finishes, while others are being made with inside colored bulbs. Approved outdoor strings for the new lamps will be available.

An interesting development in miniature lamps has been brought about by the advent of a new tiny flashlight battery only 0.4 inch in diameter and 1¾ inches long — much smaller than the standard penlight battery. Because the new battery is smaller in diameter than the miniature screw base lamp, the lamp became the limiting factor in designing smaller penlights and other such devices. For this service, new lens-end flashlight lamps have been developed with a smaller, special 1½-turn thread base. Handy new pocket lights and other miniature lighted gadgets will appear on the market shortly.

Fluorescent Lamps and Accessories

An important development of the past year was the announcement of the new "de luxe" white fluorescent lamps designed to provide excellent all-round color rendition. New phosphors in these lamps correct deficiencies toward the red end of the spectrum, apparent in previous "white" fluorescent sources, and achieve a much more desirable balance of the other colors without altering the "whiteness" of the light.

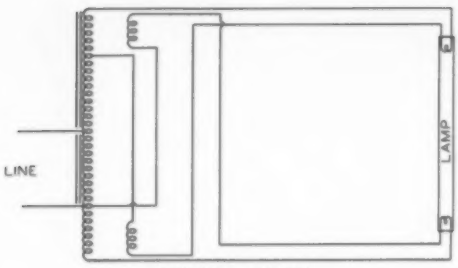
These are now available from several manufacturers in two varieties: de luxe cool white, particularly suited to working and selling areas, and de luxe warm white, desirable for social environments. In keeping with these designations, the 4500K lamps have been re-named "standard cool white" and lamps of the "warm" variety are now termed "standard warm white" by some manufacturers. In lighted appearance and "atmosphere" produced, the de luxe lamps and their companion standard lamps are similar. While the de luxe lamps give somewhat less light and are lower in brightness, their rendition of colors is far superior. It is expected that they will greatly extend the application of fluorescent lighting in those places where appearance of people and colors is of prime importance.

The English "daylight," "warm white" and "natural" white fluorescent lamps have recently been augmented by the addition of two new varieties: in "mellow" and "colour-matching." It is said that the former is flattering to the complexion and gives very good all-round color rendition on foodstuffs. The "colour-matching" lamp is reported to be almost on the black body locus at 6500K and is being used to an increasing extent by drapers and outfitters. The new French "blanc doré," or golden-white fluorescent lamps, are said to produce a most pleasant, warm illumination.

New standards for fluorescent lamp dimensions and electrical ratings have been established recently by the American Standards Association.

The 96- and 72-inch T-12 single-pin base fluorescent lamps have gained wide acceptance due to their instant start characteristics and ease of insertion in lampholders, coupled with high light output per lamp. Their companion 48-inch T-12 single-pin base lamp is growing in popularity for similar reasons. A 60-inch (including lampholders) 40-watt T-17 low brightness lamp with single-pin base has just been listed by one manufacturer. Also, 8-foot and 6-foot T-12 lamps, operated at 200 ma or 300 ma, are being used in low brightness installations where a high degree of lighting comfort is desired.

The principle of mixed gas filling for fluorescent lamps, set forth in a paper at the 1949 I.E.S. National Technical Conference, has been put into practice by one lampmaking concern. This manufacturer reports that its 85-watt 60-inch T-17 krypton-filled lamp has been superseded by a 90-watt krypton-argon fluorescent lamp with improved starting and operating characteristics. Although the new lamp consumes 90 watts, the manufacturer states that the ballast loss is less than with the 85-watt lamp because of a lower operating current,



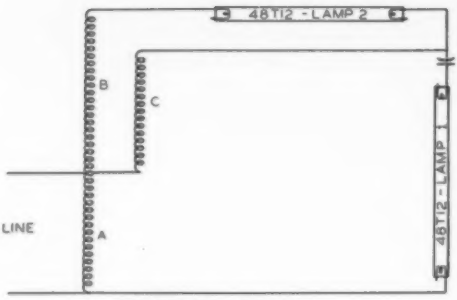


Figure 4. Schematic circuit diagrams of two recently introduced types of fluorescent lamp ballasts.

thus the total wattage increase of lamp plus ballast is only about 3 watts. It is claimed that the new lamp produces over 5 per cent more light for 3 per cent more total watts. The same concern has made a somewhat similar change in its 25-watt 33-inch T-12 fluorescent lamp, formerly filled with krypton only. The new 25-watt lamp now contains 75 per cent krypton and 25 per cent neon, resulting in improved cold weather performance and easier starting, according to report.

Progressive improvements have been made in black light fluorescent lamps. They are said to have about 50 per cent more ultraviolet output and about 20 per cent less visible light than formerly. Besides the variety of BL fluorescent lamps listed in the past, they may now be obtained in 40-watt T-12 instant start, high humidity and 42-inch T-6, 64-inch T-6 and 96-inch T-8 slimline types.

A brand new development is that of a black light blue glass from which BL fluorescent lamps and cold or hot cathode tubing can be made. Such new black light fluorescent sources appear dull blue when lighted. It is said that they produce considerably more black light radiation than the combination of BL fluorescent lamps with pot blue glass filters, while showing only slightly more visible light than BL lamps with the more costly red-purple-ultra filters.

Among fluorescent lamp operating accessories have appeared much more compact and convenient plunger-type lampholders which will accommodate all present sizes of single-pin base fluorescent lamps. These are available in the familiar "fixture" type and the "butt-on" model. One company has developed a high impact resistant bi-pin lampholder to meet requirements of the Navy. This lampholder is of the push-pull variety, with unusual follow-through plungers which hold the lamp in place even when subject to terrific shock, yet allow easy removal for servicing.

Two important new developments in fluorescent lamp ballasts have been introduced to the industry (Fig. 4). One is the "trigger-start" ballast, which makes possible virtually instant starting of the lower wattage fluorescent lamps with relatively small, low cost equipment. It is expected that these new ballasts now available for the 32-watt 12-inch circline lamp and in single and two-lamp types for 20-watt T-12 lamps, will go far toward gaining greater acceptance for fluorescent lighting in the home and other places where small, instant start lamps are desired.

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In this continuous process, the white fabric passes first through a bath of colorless fluid, then between two banks of powerful mercury lamps and emerges thoroughly dyed the desired color. It is claimed that one machine can process cloth at the rate of up to 125 yards per minute. To accommodate fairly wide material, the 3750-watt UA-7 mercury lamp, with a lighted length of 64 inches, has been used. The light chamber contains two banks of 15 lamps each, 112½ kilowatts of mercury light.

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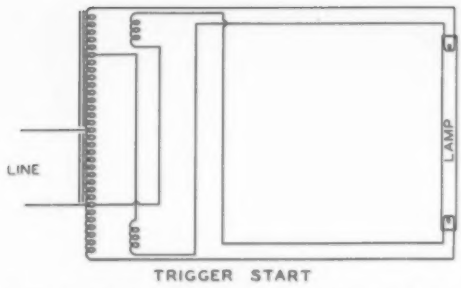

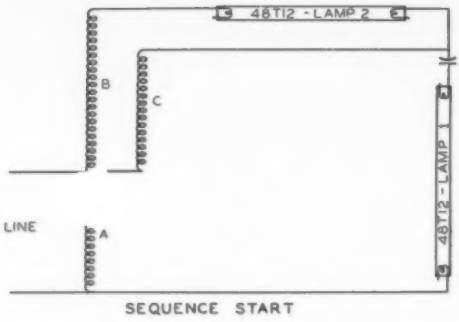

Figure 4. Schematic circuit diagrams of two recently introduced types of fluorescent lamp ballasts.

thus the total wattage increase of lamp plus ballast is only about 3 watts. It is claimed that the new lamp produces over 5 per cent more light for 3 per cent more total watts. The same concern has made a somewhat similar change in its 25-watt 33-inch T-12 fluorescent lamp, formerly filled with krypton only. The new 25-watt lamp now contains 75 per cent krypton and 25 per cent neon, resulting in improved cold weather performance and easier starting, according to report.

Progressive improvements have been made in black light fluorescent lamps. They are said to have about 50 per cent more ultraviolet output and about 20 per cent less visible light than formerly. Besides the variety of BL fluorescent lamps listed in the past, they may now be obtained in 40-watt T-12 instant start, high humidity and 42-inch T-6, 64-inch T-6 and 96-inch T-8 slimline types.

A brand new development is that of a black light blue glass from which BL fluorescent lamps and cold or hot cathode tubing can be made. Such new black light fluorescent sources appear dull blue when lighted. It is said that they produce considerably more black light radiation than the combination of BL fluorescent lamps with pot blue glass filters, while showing only slightly more visible light than BL lamps with the more costly red-purple-ultra filters.

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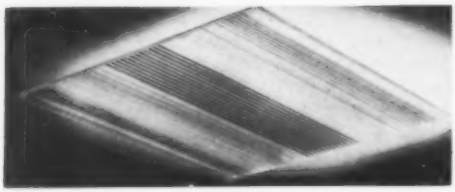


Figure 5a. New twin-lens panel for fluorescent lighting, made of a lightweight water-white crystal glass.

Figure 5b. A new strong plastic incorporating glass fibres for use in skylights, windows and artificial lighting applications.

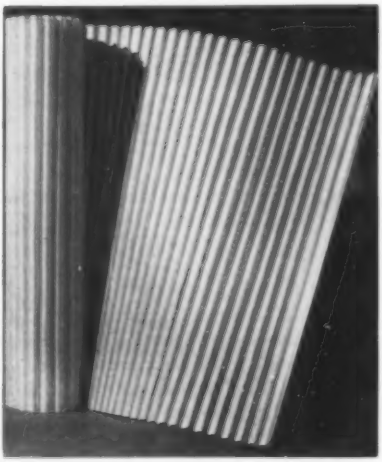


Figure 5c. New thin corrugated vinyl sheeting, light in weight and available in long rolls.

and extends into the infrared and far ultraviolet. The efficiency is stated as about 20 lumens per watt.

One-quarter-inch diameter electrodes are formed of a nickel tube packed with powdered zirconium, nickel and a few per cent of other materials. In operation, a thin film of molten zirconium forms on the surface of the electrode and furnishes light by incandescence. It is stated that if hafnium is used in place of zirconium the brightness of the lamp is doubled, but hafnium is much too expensive for commercial use.

One of the principal advantages of the lamp is that the electrodes are consumed very slowly. There is little loss due to evaporation for as the zirconium leaves the molten surface of the electrode it becomes ionized and is drawn back and redeposited on the cathode. It is claimed that electrodes can be made having a life of several hundred hours. Another advantage is that no special ventilation is required since there are no toxic fumes nor large quantities of combustion products. The arc is proposed for use in motion picture projection, studio set lighting, and as a source for searchlights and floodlights.

Materials

Glass

A new, inexpensive, light-weight, water-white crystal glass, produced by continuous tank operation, is now available in sheet form with maximum dimensions of 24 inches wide by 100 inches long. For the first time, a relatively low cost, high light transmission, non-selective glass which will pass all colors of a light source is obtainable. Although only $\frac{5}{32}$ inch thick, it is said to be as strong as double-strength window glass. It can be cut or sagged into various lengths and shapes and may be tempered if desired.

One concern is making use of this development in a new line of light-weight lens panels (Fig. 5) for low brightness control in fluorescent luminaires. These are available in single-lens and twin-lens sheets up to 11 inches wide by 100 inches long. Thus, one -piece glass panels or lenses 8 feet long can now be supplied for use with 96-inch fluorescent lamps. It is claimed that these continuous lenses are only about one-third the weight of similar pressed ware.

A new one-quarter-inch thick rolled glass of clear crystal quality, acid etched and tempered in panels 24 inches square has been developed for such applications as art gallery skylight ceilings.

Greatly improved photosensitive opal glass, now available from continuous tank operation, has resulted in a much better "Fotalite" glass with haze-

free surfaces and sharply defined egg-crate louver pattern "photographed" into the material. A new pattern of this internally-louvered glass sheet has louvers running perpendicular to the surface in one direction and at a 30-degree angle in the other. This may be useful in lighting art galleries, blackboards and bulletin panels. The possibilities of using such internally-louvered glass in windows and skylights for brightness-control of natural light are being investigated. Decorative luminous panels, with colored designs "photographed" in depth in the glass, have been produced experimentally.

Completion of experimental development work is reported on a new lightingware opal glass which will make possible light-weight pressed and blown globes for residential use, in shapes not heretofore available in opal glass for large quantity production.

A new sulphide-resisitant fired enamel applied to clear glass is being used for fluorescent fixture panels and other illuminating glassware.

Plastics

For the increasingly popular luminous ceilings and large fluorescent lighted panels, quite a variety of corrugated plastic sheets with good diffusion and transmission properties have appeared. One type is in the form of large panels, of reasonable thickness and good rigidity, in a choice of wide or closely spaced corrugations.

One supplier offers a very thin, but quite rigid, corrugated vinyl sheeting in standard rolls 36 inches wide and 100 feet long, weighing only about one ounce per square foot (Figs. 5 and 6). This material is treated with an anti-static compound to minimize dust collection and is said to be rated as "self-extinguishing" by the fire underwriters' code. It is cleaned by agitating the roll in a detergent solution.

Flat strips of extruded vinyl plastic with channel-like corrugations of square cross-section afford another variation. The sharply defined ridges produce something of a louvering effect.

A new translucent material, of countless uses, is an interesting combination of glass and plastic, known technically as thermo-setting resin glass fibre laminate (Fig. 5). Introduced in very large corrugated sheets as a low cost window and skylight material for buildings covered with corrugated metal or asbestos, it also has application for luminous ceilings, panels and sign backgrounds. It is said to be extremely strong and rigid; resistant to heat, cold and weather; can be sawed, drilled or nailed with ease; and is available in widths up

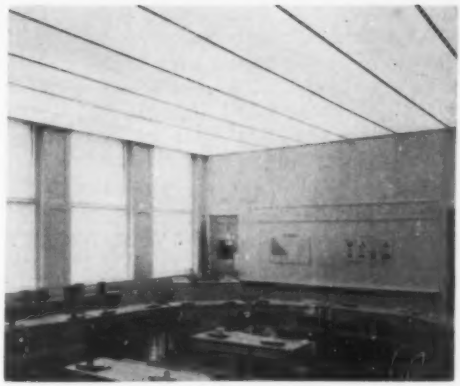


Figure 6. In this fluorescent classroom lighting installation the luminous ceiling is formed of long sheets of thin corrugated plastic rolled into place between T-bar rolls.

Figure 7. Recessed reflecting dome luminaires with silvered bowl lamps form an interesting ceiling pattern in this modern store interior.

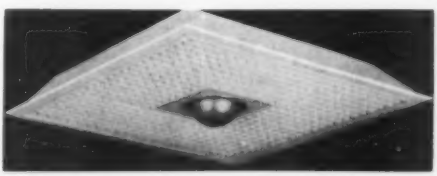


Figure 8. A large-area silvered-bowl lamp coffer unit is shielded by eggcrate louvers for comfortable general lighting.

to 42 inches and lengths to 12 feet. Quite a range of colors, finishes and corrugations may be had.

A new suspension system for acoustical ceilings and a new high-reflectance acoustical tile have been added to the list of aids to good lighting. The simplified ceiling suspension which can accommodate built-in lighting equipment consists of an arrangement of aluminum runner bars and splines, between which are slipped acoustical tiles with kerfed or slotted edges. The new acoustical material is white, highly porous, lime base tile reported to have a reflectance of 75 per cent with excellent sound reduction properties and may be painted repeatedly without loss of sound-absorption.

Lighting Equipment

Luminaires for Filament Lamps

Steadily increasing popularity of silvered-bowl lamps, for comfortable indirect lighting in the 30-footcandle range has led to the introduction of pendent luminaires for this service by many manufacturers. All of these units simply serve to shield the bright neck of the lamp from view, while presenting an attractive appearance and obstructing upward light as little as possible. However, several recent designs incorporate interesting features. One variation, of the concentric-ring type, has an outward flare at the top of each ring to reduce its height and still provide adequate shielding. This also reduces brightnesses visible in the rings, for improved appearance and comfort. Another design attains a light, airy feeling by using a sort of openwork pattern of louvers resembling a snow crystal in form.

A trend in commercial lighting luminaires seems indicated by the appearance of large reflecting domes or coffers, using silvered-bowl lamps, recessed in the ceiling or surface-mounted. Certain of these employ a spun metal shield to conceal the lamp neck (Fig. 7), while others cover the entire recess opening with large concentric ring or egg-crate louvers, but allow the lamp bowl to project through a hole in the center of the louver for easy servicing (Fig. 8).

In addition to their built-in architectural appearance, these large units make possible rather comfortable lighting at the higher levels. White or other diffusing surfaces in the domes produce a fairly wide distribution of light, while lightly-etched aluminum surfaces can give a reasonably concentrating beam for store display work.

A clever and handy device for lamp changing in silvered-bowl lamp units or other places where lamps are accessible from below consists of a long aluminum tube with a rubber cup on one end. After the cup is placed against the bowl of the lamp, a plunger is pulled down inside the tube and locked in position. The lamp is held firmly by a strong suction and may be unscrewed and removed with ease. Whether the bulbs are very large or rather small makes no difference to this lamp-changer, it works with almost all sizes.

A new luminaire component is offered to the trade in a line of swivel connectors with internal commutator rings to permit free motion without twisted wires in fixture hangers, adjustable work lights and swing arm portables.

Fluorescent Luminaires

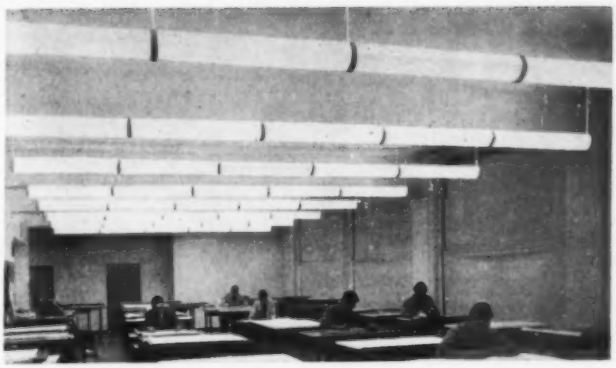
Many fluorescent luminaire designs which have come on the market recently have much more pleasing lines and general appearance than those of a year or two ago. They are gaining much more ready approval of fluorescent lighting on the part of architects and interior designers. Careful control of brightnesses for eye comfort, ready accessibility for maintenance, and ease of installation are featured.

One trend seems to be the offering of a choice of control media available for a single type of luminaire. Some fixtures may be equipped with glass or clear plastic lens plates, diffusing or lightly obscured panels, or louvers in several materials and finishes, all applied to one basic unit. A modular luminous ceiling arrangement is on the market offering a choice of egg-crate louvers, translucent corrugated plastic panels, or sections composed of parallel overlapping strips of metal for a soft, glowing effect.

One new semi-indirect luminaire consists simply of a large plastic tube, suspended horizontally between ceiling hangers (Fig. 9). The lower half of the tube is white opal plastic and the upper half is clear. It totally encloses two fluorescent lamps, side by side, and furnishes a partial answer to the problem of dust and dirt accumulation in indirect fluorescent fixtures.

An interesting new design in an all-metal, luminous totally indirect fluorescent fixture was introduced recently on the West Coast (Fig. 9). The "backbone" of the fixture is a ballast channel mounting four 96-inch T-12 lamps on the top. Lamps are concealed from view by vertical slats set parallel to the channel on each side, with virtually no surfaces where dust and dirt can accumulate.

A paper at the 1949 Conference presented a concept in louver design termed "The X-degree Louver." This louver arrangement embodies a variable shielding angle to provide a specified brightness pattern, rather than a definite degree of shielding, with the possibility of attaining higher efficiency. Commercial fixtures using this principle



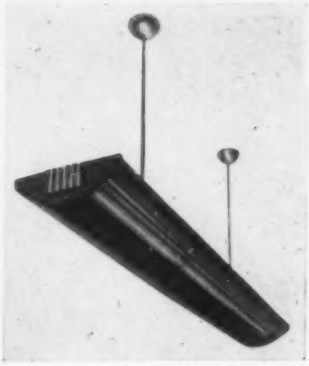
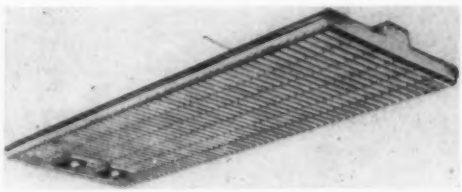


Figure 9. Some new designs in fluorescent luminaires. 9a (Top left). Semi-indirect lighting from large plastic tubes; the lower half is diffusing and the upper half is clear. 9b (Top right). Luminous indirect unit with the lamps concealed by vertical slats along the sides. 9c (Below). Shallow, large area, direct lighting luminaire. Gimbal mounted spotlights can be cut into the louvers at any desired location.



and designed to meet the "American Standard Practice for School Lighting" have been placed on the market within the year.

The principal feature of a new light-weight, low-cost industrial lighting unit is the fold-away design of lampholders and endplates, to gain economies in material, assembly, packaging and handling. It is said that four of these fixtures can be packed into the carton size usually required for one unit of conventional design.

In the 1945-46 Progress Report was shown and described an experimental model of a unique disconnecting and lowering device for maintenance of fluorescent fixtures. A much improved version of this device, incorporated in an 8-foot T-12 slimline store lighting fixture, has just been developed. The ceiling-mounted fixture channel houses the ballasts, disconnecting device and the spring-counterbalanced cable reels which permit the reflector, lamp and louver assembly to be lowered for servicing from the floor.

An extremely flexible lighting system, particularly suited to merchandising areas, is presented in a line of equipment combining long, louvered fluorescent sections with intermediate, round downlighting units fitted with lens plates or gimbal-mounted projector lamps, as desired.

A new multipurpose module lighting system has been developed, in which the basic unit is a large inverted metal pan 5 feet 2 inches square and 10 inches deep, containing three 60-inch T-17 low brightness 40-watt lamps spaced about 20 inches apart with baffles between for 35-degree crosswise shielding. The top of the pan is perforated metal with spun glass bats above it so that groups of these modules provide acoustical treatment as well as shielded lighting. The four vertical corners of each pan are bent inward in the shape of a quarter cylinder, so that where four modules join a 4-inch diameter tube is formed. Through these tubes may be installed high-velocity small-duct air-conditioning outlets, public address speakers, sprinkler heads or other devices.

A clever packaged and completely wired lighting system of large area has been announced by one manufacturer. One unit, packed in a carton 10 feet long and 6 inches x 18 inches in cross-section, unfolds to cover a ceiling area 18 feet wide by 10 feet long with a grid or ladder arrangement of eight 96-inch T-12 fluorescent lamps. Corrugated baffles, hung between rows of lamps, can be supplied for shielding, or any form of louverall or luminous ceiling material may be used to conceal them (Fig. 18).

Coefficient of Utilization Calculator

Quite a few fixture manufacturers have purchased and are using a new calculating device (described in a 1949 Convention paper) which greatly

Figure 10. Display lighting particularly tailored to each of three kinds of glassware:

10a (Top left). Smooth contour crystal on a luminous shelf.

10b (Center left). Cut crystal on a lighted shelf with strip lighting at the sides and spots above.

10c (Bottom left). Stemware with lighting "piped in" through edge-lighted shelves.

reduces the long and laborious mathematical task of computing coefficient of utilization tables for their luminaires. The calculator consists of three mechanical nomographs on which are set figures obtained from a candlepower distribution curve, and coefficients for various assumed conditions are then read from it.

Interior Spotlights

A number of new designs in housings for the popular projector or reflector spot and flood lamps are in evidence this year for display, stage and accent lighting.

One manufacturer, who specializes in large-area louvered fluorescent fixtures, has evolved a square metal housing with gimbal mount for a projector lamp, which can be set into the metal louvers at any desired point (Fig. 9). A small group of louver fins is clipped out with tinsnips and the spot unit inserted with all the appearance of a factory-built-in job. Other such devices are an "eyeball" spotlight unit which can be cut into metal louverall ceilings (Fig. 13), and a streamlined spotlight housing that may be clipped to the underside of egg-crate louvers at any point without marring them.

A swivel-mounted, streamlined housing for attachment to one form of continuous power duct has been announced. Since this may be moved with ease to any position on the duct, it is advocated for extremely flexible lighting installations in show-windows, small stages, above louverall ceilings and for point-of-work lighting in industry.

One of the most versatile of these devices is a new recessed housing which will accommodate any size projector lamp, including the new 300-watt PAR-56 as well as any screw base reflector spot or

flood. It may be positioned through a range extremely wide for a recessed unit — 0 to 90 degrees vertically and 360 degrees horizontally.

Lighting Practice

Store and Restaurant

Many of the excellent new store installations bear witness that most effective illumination for merchandising is not produced by any one type of lighting system, but is a matter of the studied combination of several systems architecturally and functionally fitted to the store design and type of merchandise.

One good example of "tailoring the lighting to the merchandise" is seen in a new installation where the articles in the glassware department have been separated into three distinct categories — smooth contour crystal, cut-crystal, and stemware — and displayed with the special lighting best suited to each group (Fig. 10).

More and more large stores are giving attention to the provision of better working conditions for their employees. This has resulted in some really good lighting jobs in workrooms, offices and other employee areas.

New supermarkets and superdrugstores are using high-level fluorescent general lighting supplemented by spotlights. One very large superdrugstore in the Northwest boasts a 100-footcandle installation over the entire area supplied by continuous lines of louvered ceiling fixtures containing three rows of 96-inch T-12 lamps.

In England and France fluorescent store lighting is gaining considerable headway and it is reported as very noticeable that shops in general are giving much more attention to the value of lighting in display (Figs. 11 and 12).

Figure 11 (Top right). From England comes this recent example of light and architecture combined for atmosphere and display.

Figure 12 (Bottom right). Fluorescent lamps, concealed by a neat pattern of louvers, and incandescent downlighting through recessed lens-plates provide 120 footcandles of illumination over the rug section of a large department store in Paris, France.

A fine New York restaurant and night-spot features the novelty of small fluorescent table lamps energized by high-frequency radiation from an aerial extended across the high ceiling of the room. Each table lamp consists of a large copper ring, set on edge in a clear plastic base, with a 4-watt T-5 fluorescent lamp mounted horizontally across the upper part of the loop and concealed by a wide, conical shade of translucent red plastic. At the top of the shade is a small black knob attached to a tuning condenser. The copper ring acts as a receiving antenna; the condenser tunes the circuit to the radiation frequency to turn on the lamp and adjust its brightness as desired. The whole idea is most intriguing to the patrons.

Another interesting sidelight in the restaurant field is the report that the Department of Health in one large city has been experimenting with black light in the inspection of cooking utensils and milk containers. The utensil is treated with non-toxic fluorescent dye, rinsed and examined under black light. Almost invisible food particles absorb the dye and fluoresce. The method is effective in demonstrating to restaurant owners the need for better sanitation and washing methods.

Sign

A surprising development of the past year has been the successful revival of the idea of black lighted outdoor bulletin boards and signs. This has been brought about by major improvements in fluorescent paints to withstand outdoor conditions and by the availability of more suitable black light sources in the form of instant-start and slimline BL fluorescent lamps and custom-made tubing. The new fluorescent paints for brushing, spraying and silk-screening have color value in daylight comparable to conventional colors and glow very brilliantly in approximately the same hues under black light. It is said that these outdoor fluorescent colors have stability and weatherability comparable to regular bulletin paints, and that all colors are suitable for boards that will be repainted every four to six months. For longer periods, only the white, green and blue colors are advised.

Another trend is marked by the appearance of large, molded-plastic, double-faced luminous projecting signs. Most of these standardized signs employ slimline fluorescent lamps for their illumination. They offer an advantage in uncluttered daylight appearance and simple maintenance, with high brightness and excellent advertising effectiveness. Large, self-illuminated sign letters, each containing its own light sources, form another variation of this new technique.

Of unusual interest to visitors from the Eastern States are the huge, color-outlined murals used to advertise numerous West Coast drive-in theaters. Many of these are rather artistic, tastefully designed scenes, painted in colorful mural technique over the entire back surface of the large, free-standing movie screens. All of the pictures' essential details are outlined in carefully selected colors of fluorescent sign tubing. This combination of painted surfaces and luminous tubing is really spectacular.

Figure 13. Under a theatre marquee, a louverall ceiling with "eyeball" spotlights set into the louvers strikes a new note in outdoor display lighting.

One sign manufacturer has made successful installations of louverall covering the entire under surface of theater marquees and lighted by fluorescent tubing, to provide 30 footcandles of illumination on the sidewalk. Projector spots, set into the louvers, light theater-front posters to 150 footcandles (Fig. 13).

Industrial

Trends in industrial lighting definitely are toward the provision of greater comfort and higher quality illumination. Fluorescent industrial fixtures featuring some upward light, better lamp shielding, and employing 96-inch T-12 lamps are gaining favor.

Specially designed fluorescent bench-lights for individual- or continuous-line mounting over work surfaces are on the market to provide high levels of supplementary lighting for difficult visual tasks.

An interesting specialty is a tiny "locating spotlight" which enables a machine operator to locate work accurately on all "blind" operations such as those encountered in automatic riveting machines and drill, punch and stamping presses. A small spot of light from the projector accurately marks

Figure 14. Very large fluorescent luminaires have made their appearance recently in several installations. Those in this banking office have luminous panels and curved sides of diffusing plastic.

Figure 15. The Senate Chamber in Washington has been given modern illumination in the form of remarkably smooth, higher-level cove lighting, with lens-plate downlighting around the gallery.

the exact place on the work where the machine will perform its operation.

Farm

It looks as though infrared reflector lamps soon may play an important part in the large poultry raising industry, if the success of one sizable installation is any criterion. A large chicken house, accommodating 20,000 chicks, was equipped with 228 of these 250-watt infrared lamps, replacing coal heaters. Thermostats control the voltage to keep conditions just right and the operators report real advantages for the new system.

The growing problem of insect pests that damage farm crops has spurred activity on insect control experiments. Recent tests have shown that the BL fluorescent lamp is far more potent than any other practical source for attracting night-flying insects.

Office

During the year, a considerable number of wall-to-wall luminous ceiling and louverall installations have been made in large and small offices and public business areas such as in banks, ticket offices, public utilities and insurance companies. Most of these are well designed and suited to the area. However, some architects and designers seem to feel that, in some instances, such very large luminous areas may become monotonous. For this reason there appears to be a trend in some installations toward the use of large luminous or louvered ceiling panels or luminaires, instead of overall ceiling treatment (Fig. 14).

A new useful office accessory is an illuminated copyholder for stenographers, typists and others. This simple device places the stenographer's notebook or copy in a nearly vertical convenient viewing position and provides shaded supplementary lighting on its from a 15-watt fluorescent lamp mounted above.

Public Buildings

In the Capitol at Washington, both houses of Congress have been relighted with outstanding cove installations in the 30- to 40-footcandle range (Fig. 15). The lighting technique and performance specifications for the equipment were determined after studies made on a full sized mock-up of a section of the proposed Senate ceiling set up in a large laboratory at the Bureau of Standards. Smooth illumination of the main ceiling in the Senate chamber is achieved by two hundred 300-watt incandescent lamps back of a continuous band of large compound lens-plates, set far back in the cove. A similar system is used in the House chamber. Committee rooms, offices and corridors are lighted with surface-mounted fluorescent fixtures and low-brightness glass lens panels.

Some recent art gallery and museum lighting installations have dispensed with daylight entirely, because of its variability, high radiant energy and cost of maintenance. Artificial lighting can be highly flexible and makes it possible to divide room space into circulation and exhibit areas for more effective display. Such a versatile lighting arrangement in one fine arts museum room (Fig. 16) consists of three systems: (1) simulated skylighting from slimline fluorescent lamps in the vanes of ceiling coffers, (2) uniform wall lighting from slimline lamps in specular asymmetric troffers around the

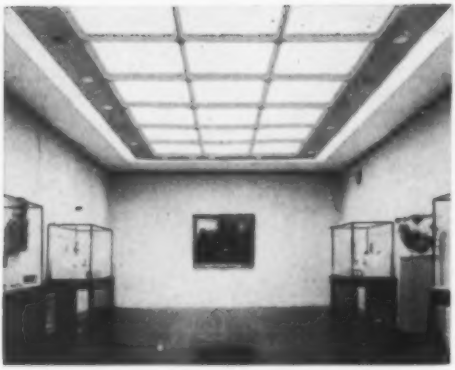


Figure 16. This "recent accessions" room in a fine arts museum illustrates the trend toward dispensing with daylight and installing flexible artificial lighting systems in museums and art galleries.

Figure 17. The surgery of a hospital in Paris, France, has been lighted with this effective high intensity system, using 60 large elliptical recessed reflectors in the semi-spherical domed ceiling.

perimeter of the room, (3) highlighting and spot-lighting from PAR-38 projector lamps recessed in the ceiling.

Hospital

From France comes the report of an excellent and unusual new lighting scheme in an operating room of a Paris hospital (Fig. 17). The principal feature of the room is the semi-spherical domed ceiling with 60 large elliptical recessed reflectors covering nearly its entire surface. The reflectors are covered by clear, heat-absorbing glass, and special shielded 24-volt 72-watt lamps are used in them to project converging beams of light concentrated at the operating table. These projectors are controlled in groups of 10 to 15 adjacent units to provide light from any desired direction with cool, glare-free illumination in the order of 1,200 to 1,600 footcandles at the the point of operation.

School

With greatly increased interest in improvement of the seeing environment in our schools, with three billion dollars worth of school construction listed, and with approved lighting techniques to meet the market, school lighting is on an upward swing.

One community in the Middle West, wanting to provide the best for their children but faced with a limited budget, worked out an interesting solution to their problem based on the concept of "putting first things first." Their school building does not look monumental from the outside because they used relatively inexpensive sheet-metal construction. But inside, their classroom design, decoration, lighting and equipment are of the best. The lighting consists of rows of etched aluminum, low-brightness pendent luminaires containing 40-watt T-17 fluorescent lamps mounted crosswise of the rooms.

A schoolroom lighting installation, worthy of note because of its simplicity and comparatively low cost consists of twelve 16-foot lines of fluorescent lamps (two 96-inch T-12 lamps end to end) mounted close against the ceiling (Fig. 18). The lines of light are run crosswise of the room and spaced a little more than 2 feet apart with 10-inch-wide baffles hung between rows. The lamps are operated at 200 ma for comfortably low brightness. Average illumination after 100 hours burning was reported as 55 footcandles.

For chalkboard lighting, a simple system composed of a row of small reflector lamp housings with 75-watt R-30 floods mounted on wiring channel at the ceiling is finding favor.

The trend toward better lighting for the gymnasium is well summed up in the Research Committee of the National Association of Basketball Coaches, to the effect that while they had considered 20 or even 10 footcandles as adequate a few years ago, they feel they must have 50 footcandles today and are enthusiastic about some 100-footcandle installations.

Residence

The public in general does not seem well informed on the tremendous strides that have been made in home lighting techniques and the worthwhile new possibilities for beauty, convenience and enjoyment of living afforded by the newer things

in lighting equipment. Several lighting demonstration centers in the industry have begun to do something about it.

A well-planned group of home lighting rooms on view in Chicago has started the ball rolling. These rooms attractively illustrate what can be accomplished in an average American home with recently developed lighting equipment available on the market, including fluorescent valance and wall lighting, certified portables, ceiling spotlights, effective ceiling fixtures and lighting for television viewing.

The timely subject of "What to do about the lighting when the television set comes on" is receiving much attention. Probably for the first time in the lighting industry, the popular colored-newsprint "comic book" technique is being used to get the story across quickly and effectively. A new pamphlet, done in this style for widespread distribution, explains in an attractive and easily understood manner how to light for best television viewing.

One utility home service group has developed and used effectively an interesting portable planned home study center demonstration to point out the requisites of good visual environment and lighting needed by the school child for doing homework. The simple apparatus consists of a large tack-board hinged to a flat work surface covered with light-colored linoleum or a pastel blotter. Suitable pin-to-wall lamps attached to the tack-board or a good table lamp properly placed, provide the lighting. Where lack of desk space in a home forces hit-or-miss study locations, such a homemade device can be set up on a table and folded and tucked away when not in use. Plans are available for making the study center at a cost of $10 to $12, including the study lamps.

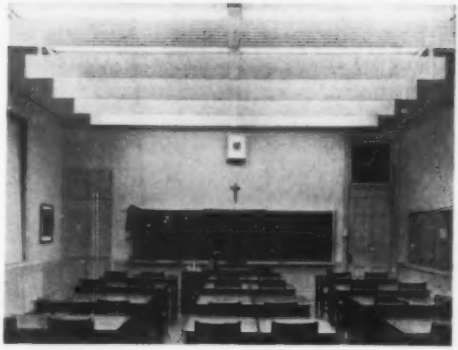


Figure 18. A new fluorescent lighting arrangement that comes packaged and completely wired unfolds to cover a large ceiling areas. In this schoolroom, one of the first installations, corrugated baffles are used to shield the lamps.

Although not a new idea, a complete system of low-voltage switching control particularly adapted to residential wiring has been marketed for the first time. The essentials of the system are tiny relays mounted in the outlet boxes, a transformer to supply low voltage for the switch circuits, and a new type of light-switch that works at a touch of the finger. Among advantages claimed are more easily installed wiring to the switches and multiple-point control of lighting from any number of switch locations, with reduced cost of this control wiring because of the low voltage.

Figure 19. The practicability of bringing the comfort, convenience and beauty of modern lighting to the average home is well shown by these new demonstration rooms.

Figure 20. The first experimental installation of this new type fluorescent street lighting equipment was made during the year.

Figure 21. Continuous fluorescent lighting in the new Brooklyn-Battery Tunnel marks a great step forward in lighting such thoroughfares.

Among the newer things in residence lighting the following equipment should be noted:

An interesting line of fluorescent valance units, faced with decorative translucent plastic panels, in 24-, 33- and 48-inch sections for T-12 lamps of corresponding lengths. These may be used singly or added together to form long valances over groups of windows or for wall-to-wall lighting. The valances incorporate their own curtain track or rod.

An unusual table lamp, of rather startling design, consisting of an indirect-lighting urn with a 2-foot parchment disc mounted on a stem and swivel above it as a reflector. It is aptly called the "Flying Saucer." A somewhat similar floor lamp has a louvered 150-watt PAR-38 spot lamp concealed in a low pottery urn on the floor and directed upward to the underside of a large, slightly dished, glass fibre disc pivoted about 5 feet above.

Low-cost industrial type luminaires with two 33-inch 25-watt fluorescent lamps for laundry and work areas.

Easily installed adapters for converting table or floor portables to the use of R-40 white lamps.

Outdoor Sports

Planners of sports lighting installations are becoming more conscious of the need for greater consideration of spectator comfort. This means more precise control of the lighting to concentrate on the playing area and keep it out of the eyes of those in the stands. New football stadium installations have been designed using narrow-beam projectors for this reason.

One racetrack lighting installation incorporates the feature of complete dimming control of the track lighting, so that the illumination level can be reduced for spectator comfort between races.

A practical solution to backyard sports lighting is now available through the introduction of lightweight 12-foot telescoping poles with three adjustable sockets for weather-resistant flood and spot lamps mounted at the top. The poles can be spiked into the ground or set in permanent sockets driven into the earth.

Street, Bridge and Tunnel

A few experimental installations of newly designed fluorescent street lighting luminaires have been made during the year. In one of these (Fig. 20) each unit consisted of two long reflectors set back to back, extending horizontally above the street at a 28-foot mounting height and 80-foot staggered spacing. There are two 96-inch T-12 lamps in each reflector, protected by a formed plastic cover. The unusual feature of this unit is that the two reflectors are mounted so their outer ends touch, but the ends near the pole are spaced apart to form a "V." This accomplishes desired asymmetric distribution. The lighting results are reported as excellent.

A new era in underground thoroughfare lighting was heralded by the opening of the new Brooklyn-Battery Tunnel last May (Fig. 21). "Pipelines" of fluorescent light illuminate the two 9,117-foot-long vehicular tubes from portal to portal. Twelve-foot-long Pyrex glass cylinders, each containing two six-foot fluorescent lamps in series, form continu-

ous lines of light at the juncture of wall and ceiling along each side of the roadway. Three thousand of these unit sections are used. Cold-cathode lamps are used in the main portion of the tunnels, while hot-cathode tubes are employed for quite a distance at each end for greater illumination near the entrances. A principal feature of the installation is the sectionalized, variable-current control of the lighting, which permits wide variation and smooth graduation of the light according to changes in the outdoor brightness. It also enables adjustment to compensate for decrease in illumination due to temperature changes and lamp depreciation. Two photocells in each tunnel monitor the lighting and indicate any variation from predetermined values.

In England, they have developed very large, molded plastic lamp enclosures for sodium, mercury and fluorescent street lighting (Fig. 22). Portions of these enclosures are stippled, "doughed" or opalized where diffusion is desired, and more accurate control of the light is provided by lens patterns molded in the clear portions. They also are using large ribbed plastic forms around some incandescent street lighting units.

A boon to street lighting engineers and municipal officials is the new Rapid Recorder for measuring street illumination. This is simply an "electric eye on wheels" trailed 30 feet behind an automobile to obtain an unobstructed view of the lighting. An amplifier and recorder in the car are connected to the light-sensitive cell and to the speedometer. While moving at a rate of 10 to 20 miles an hour, an accurate record of distance and illumination is traced automatically on a roll of tape by the recorder.

A most unusual roadway lighting installation has been made on a new, two-level highway bridge near Boston. Since traffic on each level is in one direction only, it was found practical to conceal the lighting from the motorists by recessing PAR-46 sealed-beam automotive fog lamps in the handrail posts, at either side, and aiming them in the direction of travel.

Transportation

A new PAR-36 amber lens, all-glass sealed beam direction signal lamp, in 6-volt and 12-volt types, makes possible much better turn-indication lights for large highway vehicles in the truck and bus class.

The constant-voltage variable-frequency slimline fluorescent lighting system for motor-coaches (mentioned in last year's Progress Report) has proved so satisfactory that the New York City Board of Transportation has ordered 400 buses lighted in this way.

For new designs in railway coaches, there has been developed a 25-watt 30-volt PAR-36 all-glass sealed-beam lamp, with shielded filament and "utility" lens, for overhead-mounted reading lights. Two of these lamps will be recessed in the under side of the bag rack above each pair of seats and switched separately for the convenience and comfort of individual passengers.

Soft fluorescent illumination bids fair to become accepted practice in our large commercial airliners. For example, the huge Stratocruiser, in the service of at least four domestic airlines, employs 30 fluorescent lamps of both straight and circular types in the lighting of its luxurious interior. The version of this plane supplied to two foreign airlines uses 57 fluorescent lamps.

Airport

The lighting of airport aprons and loading zones has always been a problem. The use of slimline fluorescent lamps in carefully designed optical systems to provide good visibility with a minimum of glare to either the passenger or the plane pilot is

Figure 22. Large molded plastic enclosures developed in England for various types of street lighting units.

one answer. An experimental installation of this sort has been made at the Baltimore, Maryland, airport and is being studied with interest.

A new elevated taxiway marker light developed to meet CAA specifications employs what might be termed as the "shortest slimline," a 15-inch T-6 single-pin base, instant-start blue fluorescent lamp. The totally-enclosed marker contains two of these lamps forming a "V" with one lamp horizontal and the other converging at a downward angle. These bright blue "arrows," spaced along each side of the lane, point out the taxiway. Each lamp operates at 49 volts and consumes 9 watts at 200 ma. They are burned two-in-series, and an open-circuit voltage of 1600 to 2000 volts is supplied to assure quick positive starting down to minus 45 F.

New sealed-beam lamps with rugged filament construction have been introduced for elevated runway lights. One version is a PAR-46 with clear lens, and another is a PAR-56 with a new lens designed to produce a desirable asymmetric beam pattern.

Most of the high intensity runway lights have from three to six separate glass optical elements incorporated in their design. A new military type unit just introduced reduces this number to one glass enclosure whose lens moldings perform all the necessary functions. This one-piece construction makes possible reduced weight, lower cost, simplified maintenance and greater standardization. The new design is said to accomplish greater distance of signalling to a plane aligned for landing, combined with greater range of guidance to circling aircraft preparing to land.

The Armed Forces

This year, development work was completed on an individual ring method of lighting for aircraft instruments and standardization on this system for all military aircraft has been made official by the U. S. Air Force and Navy Bureau of Aeronautics. In this system two tiny lamps (closely resembling short .22 caliber cartridges) are set in small red plastic sleeves above the face of each instrument and concealed by a ring-shaped shield which frames the dial.

A very lightweight, portable operating-table lighting unit will be made part of the equipment of field hospitals. It provides about 300 footcandles of practically shadowless illumination from battery-operated lighting equipment and will give the surgeons in the field their first real lighting unit to perform operations which might be so difficult as not to be attempted in any but fully-equipped regular hospitals.

Development work is continuing on evaporated reflecting surfaces, protected by a coating of silicon monoxide, for searchlight mirrors and other projectors. Reflectors as large as 60 inches in diameter have been produced in this way. This is a new technique which as yet has not had much commercial use but should increase in importance when its full significance is realized by the lighting industry.

A great deal of the military development effort is being spent to provide for seeing in total darkness with the aid of infrared image tubes. Considerable progress has been made in the design of higher voltage tubes which have high resolution and are from 10 to 12 times more efficient in converting infrared to visible light. Techniques have been improved in forming interference type reflectors which are almost black to the eye but have very high infrared reflectivity.

Figure 23. The advent of a practical three-color meter for checking color quality of illumination should prove of considerable interest in the fields of color photography, cinematography and color matching.

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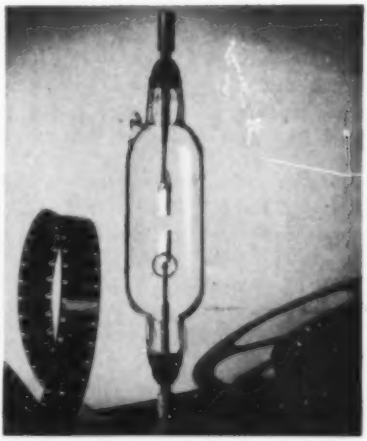

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Figure 24. This new repeating flashtube makes it practical to use shutterless projection in televising movie film.

Figure 25. The main demonstration room of the Lighting Service Bureau in London, England, has been completely remodeled with interesting new displays.

Fluorescent lighting is rapidly displacing filament lamp illumination in living and working spaces aboard Naval vessels. The special fluorescent luminaires will withstand high impact shock and vibration.

Reflector flood lamps for producing both red and white light have been adopted recently by the Navy for high-bay lighting on hangar decks of aircraft carriers.

Neon lights are being introduced for self-illuminated crosses on hospital ships. These crosses have six 30-foot arms so arranged that they can be identified from all directions.

New battery-operated red and green gaseous discharge lamps are being developed as running lights for towed vessels where they may have to operate continuously, unattended for as long as 30 days.

Experiments are being conducted with ozone-generating lamps and tubes for purifying air aboard ship, and with types of discharge lamps for air sterilization and for irradiating the quarters on submarines with erythemal energy.

Photography

The home movie photographer and others will welcome a compact new 300-watt medium beam reflector photo lamp in an R-30 bulb rated at 4 hours maximum life. Its beam spread of about 40 degrees corresponds to the effective angle of the usual camera lens so that practically all the light may be concentrated on the actual picture area.

A new small U-shaped repeating flashtube has made available lighter weight, lower cost flashtube equipment for professional photographers and advanced amateurs. Because of its long life, this tube can be sealed into a spun aluminum reflector with a permanently attached plastic cover and supplied as a unit by the equipment manufacturer. The small power pack and reflector are fastened directly to the camera. The long supply cord can be plugged into any standard voltage convenience outlet or into a small portable battery power-supply unit.

A tiny 1½-watt high intensity neon glow lamp has been developed for exposing time-interval marks on the edge of color-film used in ultra-high-speed photography. The 25-hour lamp life is ample because the expected life of an expensive high-speed camera is only 6 hours of actual operation.

Marking a further step forward in the application of precision methods to color photography, cinematography and the field of color matching in general is the very recent development of a small and convenient three-color meter for checking the color quality of an illuminant (Fig. 23). Since this instrument does not use Kelvin temperature as the basis of measurement, it will work not only with black body radiators but with any light source whose characteristics place it near the black body curve. The meter readings are in the form of a so-called Spectra Index which establishes the ratios of blue to red and of green to red in the light. By setting this reading on a special pocket calculator, the proper color filters can be selected to match illuminant and color film.

The Graphic Arts

Banks of green slimline lamps are proving most effective for copy-board lighting in the production of photostats and are being accepted rapidly by that industry.

In producing the plates for four-color printing work, a system of "turnstile" copy-board lighting has been introduced. The usual arrangement for

this work has been the use of white flame arcs, totaling about 7700 watts, for lighting the copy, with different filters placed in front of the camera lens for color separation. Turnstile lighting equipment consists of two four-sided columns with a bank of reflectors and colored slimline fluorescent lamps with plastic color filters on each side. By turning the columns, the copy can be lighted in red, green, blue or yellow, with no filters in the camera optical system. The fluorescent equipment totals 400 watts per color. The principal advantage is said to be improved quality of the color reproduction.

Television

In television studio lighting the trend is toward extremely flexible systems in which all cables and equipment are kept off of the floor. This is being done by using many overhead battens of continuous power duct or wiring channel with power outlets every few feet for controllable circuits. Banks of slimline fluorescent lamps and filament lamp projectors are suspended from the battens on "lazy-tongs" hangers which permit them to be lowered nearly to floor level.

"Process projection" of moving or stationary backgrounds on a translucent screen behind the actors has been accomplished successfully in some television studios.

A new repeating flashtube is being used in shutterless projection for televising movie film (Fig. 24). This tube has sleeves of refractory material shielding its electrodes to restrict effective light to the arc discharge. It is flashed 60 times a second in a specially-designed projector, with a very high-speed pull-down mechanism capable of changing film frames between flashes. Because the film will not overheat when stationary in this projector, it is not necessary to run the picture while focusing and adjusting the television camera. Lower lamp cost per hour than with short-life projection lamps is claimed.

Lighting Education

In London, England, the Lighting Service Bureau has completely reconstructed its main demonstration room with interesting new commercial lighting concepts and has fitted into a small space about fifty beautifully executed domestic lighting demonstrations (Fig. 25). Plans are being made for remodeling the rest of the Bureau shortly.

The French are using an effective traveling lighting demonstration truck technique and have featured huge well-designed lighting and lamp displays at large expositions.

In Canada, a small well-planned Lighting Institute has been opened and is gaining a name for itself as the place to go for lighting information.

In this country, a cooperative effort of lamp manufacturers, electric utilities and lighting equipment suppliers brings "traveling lighting clinics" to a large number of cities. These clinics hold a series of meetings, each aimed toward informing a group of people with interests in a specific lighting field through demonstration lectures, fixture displays and consultation encompassing only that field.

A fruitful Conference for Visual Research Specialists was sponsored by one lamp manufacturer this year. This is probably the first such step to be taken by a member of the lighting industry. Quite a few of those attending are working on I.E.S. Research Fund projects. It is expected that the conference will become an annual affair.

In institutions of higher learning, more opportunity for education in lighting was made available. Mississippi State University added a complete Lighting Option to its curriculum.

"Living with Light," a new program of teaching materials for instruction in light and sight at the junior high school level, was offered to our schools. It includes a program book, a teacher's guide, three slide-film strips and six four-page study leaflets for distribution to pupils.

Reprints of "Contemporary Lighting for Modern and Traditional Interiors"

Attractively bound reprints of the complete I.E.S. Study Report, "Contemporary Lighting in Modern and Traditional Interiors," concluded in the November issue of ILLUMINATING ENGINEERING, are available for distribution in single copies or quantities. This 60-page publication covers the entire field of contemporary residential lighting and is an ideal lighting reference for architects, home lighting specialists and consultants, interior decorators and contractors. Light and power companies, manufacturers of residential fixtures and portables will find it an excellent promotion piece for their preferred lists which include these customers. Single copies up to 10 are priced at $1.00; quantity prices upon request.

Glow Switch Transients for Starting Fluorescent Lamps

By F. H. RIXTON

The adoption of the use of krypton as fill gas in some fluorescent lamps imposed a more difficult starting problem on fluorescent starters and made it necessary to investigate glow switch characteristics as a step in improving the starting transients produced by existing designs. This investigation disclosed new information pertinent to glow switch design and fluorescent starting problems. The principal items discussed are a new method of transient measurement, the nature of glow switch transients and the effect of a parallel connected condenser, gas mixture components, gas pressures and electrode design on these transients. A comparison of transients from glow, vacuum and thermal air switches is presented. These data are used to explain the operation of a glow switch and the relation of switch transients to fluorescent starting requirements.

BASICALLY, a glow switch is a glow discharge device containing two elements: a bimetallic electrode, which is responsive in movement to changes in temperature caused by the discharge, and a small diameter wire electrode with which the bimetal makes contact. Materials such as emission coatings, oxygen—and moisture-absorbing getters, and radioactive metals are used for refinement of operation but will not be discussed here. In operation, the bimetal makes contact with the opposite electrode which allows preheat current to flow through the fluorescent lamp cathodes and then separates from that electrode causing a transient voltage from the lamp ballast to be applied to the lamp.

A number of articles have been published explaining the fundamental design of glow switches and their function in starting fluorescent lamps.[1, 2, 3, 4] The nature of glow switch voltage transients and their relation to lamp starting, however, is not widely known. The demands imposed on glow switch operation have been materially increased by the trend toward the use of krypton rather than argon fill gas in fluorescent lamp designs.[5] This condition, together with adverse humidity[6, 7] and circuit conditions, makes general glow switch designs unsuitable for reliable lamp starting. Typical of adverse circuit conditions is the absence of conducting material adjacent to the lamp[6] and low line voltage.

A prerequisite to improving the transients obtained through the use of glow switches is a knowledge of the size and nature of transients produced by existing designs. A method was devised for measuring such transients and observing their nature and the effect of design changes on the transients.

Test Circuits and Equipment

The tests reported herein are confined to switch designs applicable to 20-watt T12 and 25-watt T12 fluorescent lamp circuits. Referring to Fig. 1A, one cathode of each of two fluorescent lamps was connected in series with the ballast to simulate a dead lamp condition. A Dumont Type 248 oscilloscope with a Dumont Type 261 probe having an attenuation of 20:1 was used for observing wave forms. A convenient feature of the oscilloscope is a driven sweep circuit which is triggered by the applied pulse. The probe was connected to the ballast side of the glow switch with the line side of the switch grounded. Wave forms of voltage (Y-axis) with respect to time (X-axis) of an inductive (lag) type fluorescent circuit were observed during two periods; the period during which there is a glow discharge between the switch elements and the period during which the electrodes separate producing the voltage transient as a result of energy stored in the ballast.

It is known that the area under the voltage trace is the important feature of the starting transient rather than peak voltage.[5] One method of calculating this area is graphic integration but integrating it electronically is more convenient. A circuit for integrating the area is shown in Fig. 1B. In this circuit the integrating condenser charges through a resistor to a voltage proportional to a summation of the products of instantaneous amplitude and time of the voltage pulse. A careful selection of resistor and condenser is necessary to insure an accurate integrating network. The condenser voltage appears as a vertical deflection on the oscilloscope screen. The oscilloscope may be calibrated in terms of volt-seconds of area by the use of the inte-

A paper presented at the National Technical Conference of the Illuminating Engineering Society, Pasadena, California, August 21-24, 1950. Author: Westinghouse Electric Corp., Bloomfield, N. J.

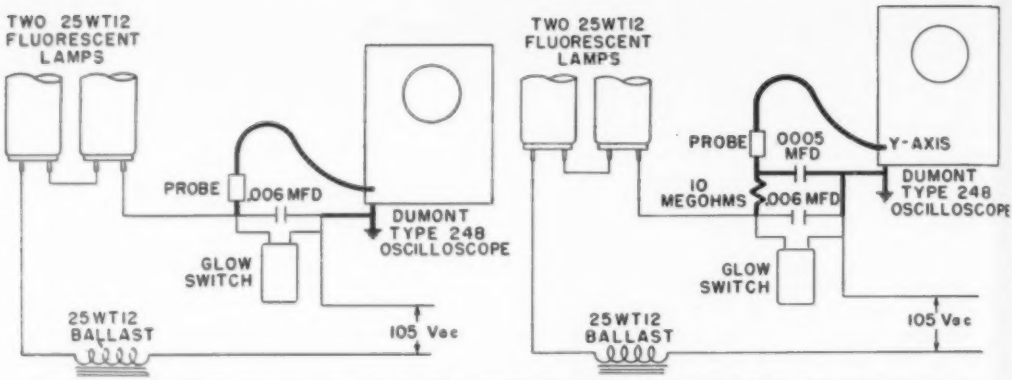

Figure 1A (Left). Circuit for observing glow switch peak transient voltage. Figure 1B (Right). Circuit for measuring glow switch transient voltage area.

grating circuit and a square wave pulse generator. The oscilloscope deflections resulting from the applied square wave pulse of known voltage and duration are plotted against the respective pulse areas to accomplish the desired calibration.

Explanation of Switch Operation

Referring to Fig. 2, the amplitude of the voltage trace during the glow or switch closing period (*AB*) is inversely proportional to the size and emissive ability of the electrode which happens to be cathode. The positive portion of the switch voltage trace during the glow period shows a low breakdown point. Emission saturation is indicated by the rise in voltage which follows. Low breakdown is probably brought about by a concentrated field on a small electrode and emission saturation by the small electrode area. During the other half cycle the reverse is true.

Preheat current flows through the lamp cathodes during the period (*BC*) when the bimetal is in contact with the opposite or contact electrode. The bimetal cools and begins to move away from the contact lead. Upon separation, a transient is produced by rapid current change in the inductive ballast. It is this transient which assures lamp starting. If the two elements separate to produce a transient with the contact electrode negative, a sharp rise to about 1000 volts is followed by a decay similar to condenser discharge (*CD*). If the bimetal is negative, the transient pulse (*EF*) is smaller because more of the energy stored in the ballast is dissipated in the switch. Lamp starting is almost always accomplished when the contact electrode is negative upon switch opening and the switch usually makes another attempt if the opening occurs when the bimetal is negative. Intermittent sparking between the contacts is responsible for the momentary dips in the voltage curve.

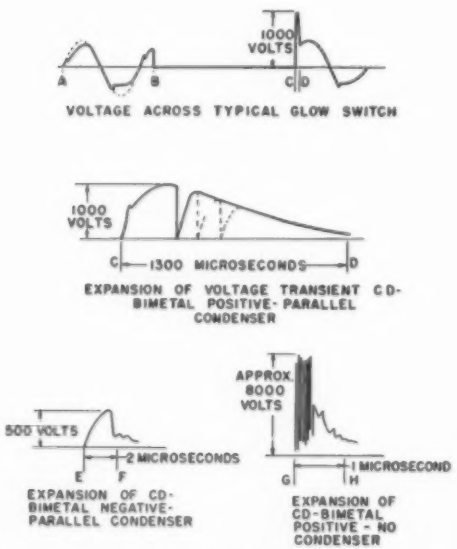

Figure 2. Voltage wave form of typical glow switch.

Effect of Parallel Condenser on Voltage Transient

A small condenser in parallel with the starting switch is generally incorporated in fluorescent lamp starters for the purpose of radio interference suppression. It also performs the additional function of aiding lamp starting. The peak voltage (Fig. 2) which occurs without a condenser across the glow switch is approximately 8000 volts compared with 1000 volts which occurs when the condenser is present. However, the pulse duration in

the first case is only one microsecond compared with thirteen hundred microseconds in the second case.

When no parallel condenser is used, the voltage across the electrodes rises at the instant of contact separation and is sufficient to initiate a discharge in the switch. At this instant, ideal conditions for establishing an arc exist because the diminishing area of contact immediately preceding the metallic break produces minute hot spots capable of carrying current with low resistance. The gas pressure, however, is too low to concentrate the discharge which is necessary for maintenance of the hot spot temperature. The resistance to current is thereby increased and quenches the arc but not until most of the energy stored in the inductive ballast has been dissipated. The voltage pulse observed occurs when the arc stops. Although the pulse amplitude is high, the duration is extremely short so there is very little area representing pulse energy under the trace.

When a condenser is used across the switch, the voltage is zero at the instant of contact separation and build-up is delayed by the charging of the condenser. The delay is sufficient to allow the hot spots of the last metallic contact to cool and make conditions less suitable for initiating an arc. Some sparking is observed but is not sustained. The discharge is in the form of a high resistance glow so the current is more quickly reduced than with an arc discharge and less of the energy stored in ballast is dissipated in the switch. Although the pulse amplitude is reduced, the duration is considerably lengthened. The result is greater pulse area representing increased energy available for starting a fluorescent lamp.

Voltage Transients Produced by Vacuum and Thermal Air Switches

A .006 microfarad condenser was used in parallel with vacuum and thermal air switches on test as in the case of glow switches. The pulse voltage areas (Fig. 3) produced by vacuum and thermal air switches, are considerably larger than those produced by glow switches, the vacuum switch area being the greater of the two. The difference is due to the portion of the energy stored in the ballast that is dissipated in the respective switches. Both switches are very reliable in lamp starting performance. The voltage trace of the vacuum switch is smooth compared with that of the thermal air switch which is broken up considerably. The use of glow switches rather than thermal or air devices, of course, allows a desired simplification of circuit and auxiliary components and supplies the demand for a more economical starting device.

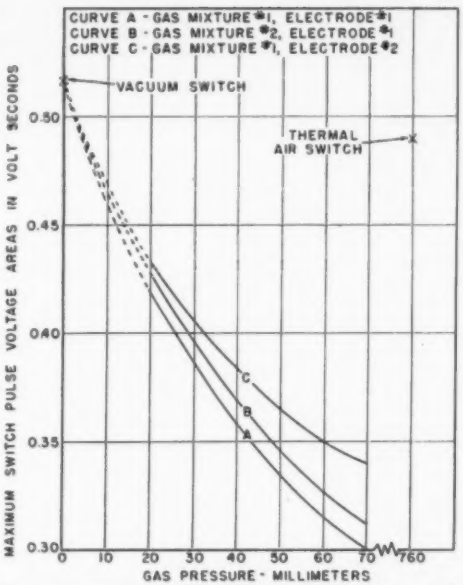

Figure 3. Effect of fill gas mixture and pressure and electrode configuration on glow switch transient voltage areas.

Effect of Fill Gas Pressure and Composition on Voltage Transient

It may be noted in Figs. 3 and 4 that as the fill gas pressure is reduced toward a zero pressure condition, the pulse area and peak voltage approach those produced by a vacuum switch. The values obtained from the ideal glow switch would result in a more nearly flat pulse area versus pressure curve holding near the level of vacuum switch output. In a practical switch a compromise must be made in pulse area by using a suitable gas for desired breakdown voltage, a gas pressure high enough for satisfactory life and suitable electrode design to give fast switch closing.

Fig. 3 shows an improvement in transient area of Curve *B* over Curve *A* even though the peak voltages are somewhat reduced (Fig. 4). This was the result of changing the fill gas mixture from 99.5 per cent neon - 0.5 per cent argon (gas mixture No. 1) to 99 per cent neon - 1 per cent krypton (gas mixture No. 2). Although the use of similar gas mixtures may improve the transient area slightly, it may increase switch closing time.

Effect of Electrode Design on Voltage Transients

Curve *C*, Fig. 3, shows the improvement over Curve *A* realized by redesign of electrodes. The design is shown in Fig. 5. Design changes which

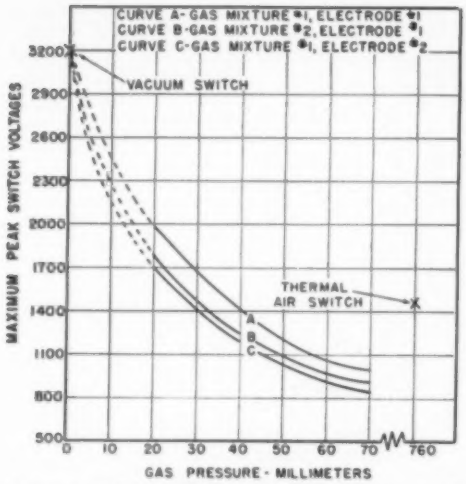

Figure 4. Effect of fill gas mixture and pressure and electrode configuration on glow switch peak transient voltages.

are advantageous for fast switch closing in capacitive (leading power factor) type circuits, such as increased fill gas pressure and larger contact electrode size, are detrimental to pulse voltage area. Conversely, the higher resistance the switch has to

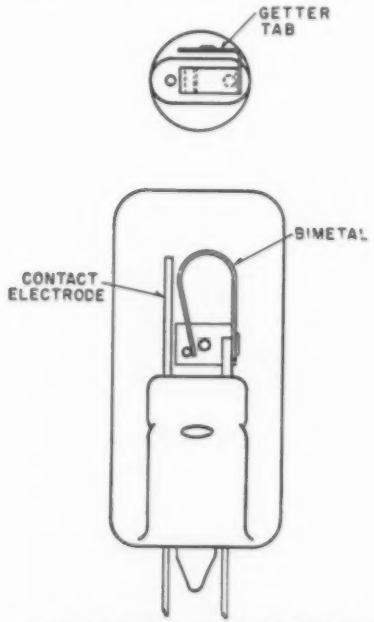

Figure 5. New design glow switch. (Electrode No. 2—Figures 3 and 4).

current flow due to reduction in electrode area, the greater the pulse voltage area and the lower the glow current. A compromise in electrode design must be made to reach the optimum overall results. The design represented by Curve *C* has the advantages of satisfactory closing time in capacitive circuits and sufficient pulse area for starting krypton filled lamps such as the 25-watt T12.

Comparison of Designs

The voltage transients and switch closing time produced by glow switch designs may differ considerably, depending on the design factors previously explained and quite different designs may be recommended for the same application. This is largely responsible for variation in starting results between different manufacturers' products.

Table I is presented for illustration. Switch design numbers 1, 2, and 3 show progressive improvement in switch design. Characteristics of vacuum and thermal air switches are included for comparison.

TABLE I.

Starters Used for 20-Watt Fluorescent Application	Approx. Peak Transient Volts	Approx. Transient Voltage Area (Volt-Seconds)
Switch Design #1	260	.185
Switch Design #2	650	.250
Switch Design #3	1200	.325
Thermal Air Switch	1475	.490
Vacuum Switch	3200	.517

As stated earlier the actual value of the peak voltages are not too significant. The switch designs having the greater transient voltage area produce the more reliable lamp starting.

Conclusion

Introduction of krypton lamps with accompanying more difficult starting has so far created a requirement that has been successfully satisfied with two new glow switches using the preceding information as a basis for proper design. As new lamp types are developed which require new switches for reliable starting, these principles of switch design will prove valuable as a design guide.

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DISCUSSION

D. D. HINMAN*: It has been known for a long time that a high voltage transient is not the only starter characteristic necessary for reliable lamp starting. The duration and energy of this transient are important as well as voltage. Since no better means was available to measure the starter transient, lamp starting tests have been commonly used in the past, but these at best gave only a crude quantitative measure of the transient. Fluorescent starter development has been handicapped by the lack of a good method of measurement. Although the volt-second rating described by Mr. Rixton does not include the need for a minimum transient voltage, it is a step in the right direction, and it and other recently devised methods of measurement have already led to the development of better starters. It is interesting to note that the more difficult starting of krypon-filled fluorescent lamps, which was apparently a disadvantage, has resulted in the improvement of starters for argon-filled lamps as well.

F. H. RIXTON**: The author wishes to express appreciation to Mr. Hinman for his constructive comments.

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**Author.

The existence of a minimum pulse voltage below which reliable starting cannot be realized even though the pulse duration is extremely long should not be overlooked and it is not the intent of the author to minimize its importance. The fact remains, however, that transients having the higher peak voltages do not always result in the higher pulse energies nor do they necessarily start lamps reliably. The test range discussed in the paper appears to be well above such a minimum voltage requirement, since square wave pulses in the order of 400 and 450 volts were found to reliably start 25-watt T12 lamps when the pulse durations were 1000 and 600 microseconds respectively.

The data used for preparing the curves correlated very well with actual lamp starting tests. The lamp starting technique of measuring glow switch design performance, however, requires the recording of lengthy statistical data, is affected by lamp quality, lamp design, humidity, ambient temperature and proximity of test lamps to conducting material and, as Mr. Hinman points out, gives at best only a crude measure of switch performance.

Shoe Store Lighting

Lighting for the selling area of the Schiff Shoe Company, Utica, N. Y., was designed to show the merchandise in true color with sufficient intensity at the floor level where buying decisions are made. Down the 89-foot length of the store a row of eleven glass-bottom direct fluorescent luminaires are recessed in the ceiling, each unit having two 40-watt T-12 48-inch white lamps. These are flanked on each side by a row of 200-watt PS-30 clear lamps. Average illumination at the 18-foot-wide floor is 50 footcandles. Fluorescent cove lighting supplies general illumination and shadow box lighting highlights feature displays. The ceiling, eleven feet three inches high, is dusty rose with a reflectance of 60 per cent. Walls are bleached mahogany, and rose and white paper with reflectances of 40 and 60 per cent respectively. (Installation and data supplied by J. C. Bannigan of Niagara Mohawk Power Corp., Utica, N. Y.)

Luminous Ceiling Lighting for a Machine Shop

By DOMINA EBERLE SPENCER,
RICHARD B. HEADLEY, and LEONARD F. MARTIN

THE REPORT of the Committee on Lighting for the Machining of Small Metal Parts[1] is an achievement of which the Illuminating Engineering Society may well be proud. The emphasis is placed where it belongs on the quality of the lighting system rather than on the "right" number of footcandles for the task.

It was found that quality of lighting was the most important factor in obtaining good visibility of the seeing tasks and comfortable seeing conditions. ... The experimental work indicates a desirability of diffusing light sources of comfortably low brightness which subtend a large angle at the point of work. ... The general lighting should, insofar as is practical, meet this specification.

Since a complete luminous ceiling is the only type of lighting that could possibly satisfy all of the visual criteria and still be practical from the maintenance standpoint, the test of such a ceiling in an actual machine shop now becomes advisable.

A trial installation of luminous ceiling lighting was set up in a milling machine room at Brown University. Basic methods of design previously developed[2, 3, 4] were applied to produce a luminous environment which would give optimum visual conditions for any position of the worker. Reflectances were chosen to satisfy the 3 to 1 ratio, and colors[5] were selected according to a method previously developed (Table I). Mr. Alpha Learned, Instrument Maker of the Physics Department participated actively in the plans and in their execution.

The luminous ceiling itself employs thin, flexible, corrugated plastic in strips nearly three feet wide running entirely across the room. The upper part of the room is obstructed by numerous pipes which are painted gloss white. Lamps are placed below the principal obstructions, 27.5 inches above the plastic. Slimline lamps were used with a maximum lamp spacing of 29 inches. This arrangement provides reasonably good uniformity of the luminous ceiling even when only alternate rows of lamps are lighted. Data on the quantity and quality of the resulting distribution of light

TABLE I.—Room Characteristics.

Reflecting Surfaces	Reflectance	Munsell Specification
Upper Wall	0.867	N 9.6
Lower Wall	0.588	N 8.5
Floor	0.150	5R 3/2
Bench Top	0.942	5Y 9.5/4
Machine Gray	0.302	7.5B 9.5/4
Machine Yellow	0.894	5Y 9.6/4
Structural Ceiling	0.867	N 9.6
Wall above Luminous Panel	0.867	N 9.6
Transmittance of Plastic	0.515	
Reflectance of Plastic	0.426	

TABLE II.—Distribution of Light.

Average Illumination at ¼ Ceiling Height	51.2 ft-candle	550 lumen m^{-2}
Average Illumination at ½ Ceiling Height	66.8	718
Brightness of Walls Midway Between Ceiling and Floor	28.6 ft-lambert	307 blondel
Brightness of Luminous Ceiling	125	1,341
Brightness of Floor	10.3	111

are given in Table II. They are in excellent agreement with predictions based on the interflection method, if the effective reflectance of ceiling above the plastic is taken as 0.70 to allow for trapping of light between the pipes.

Let us examine possible objections to luminous ceilings in machine shops: (a) Maintenance, (b) Fireproofing, (c) Cost.

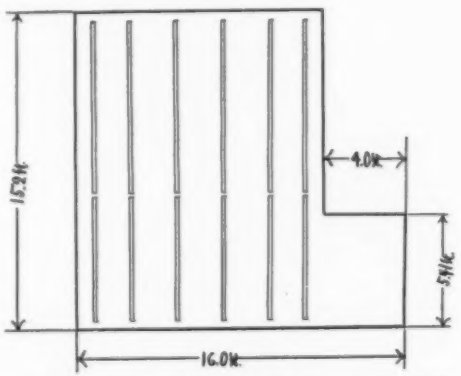

Figure 1. Spacing of the lamps above the luminous ceiling.

Prof. Spencer and Mr. Headley are at Brown University, Providence, R. I. Mr. Martin is with the Martin Electric Products, Inc., Somerville, Mass.

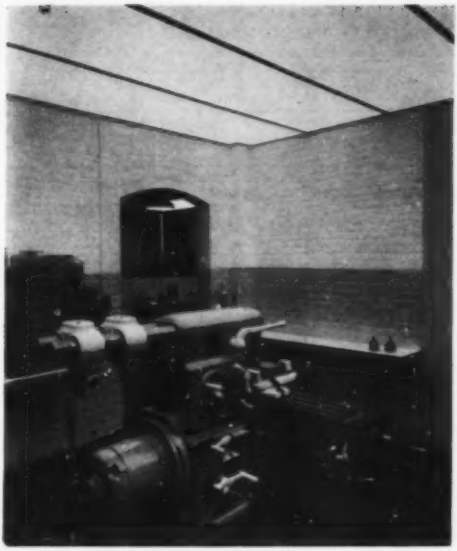

Figure 2. View of the repainted and relighted shop.

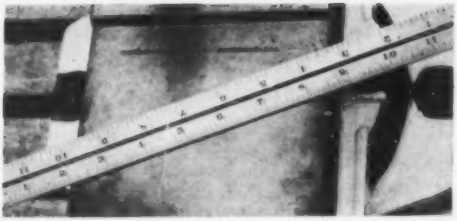

Figure 3a. A steel scale viewed under a luminous ceiling. The large light source provides a uniform background for the divisions of the scale.

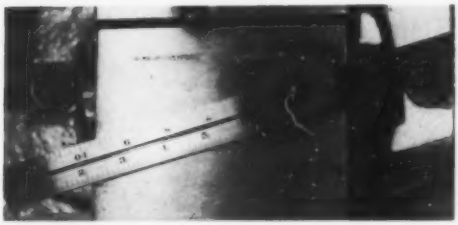

Figure 3b. The steel scale lighted by an industrial reflector. Note the large variation in the background (40:1), which gives a glaring field of view.

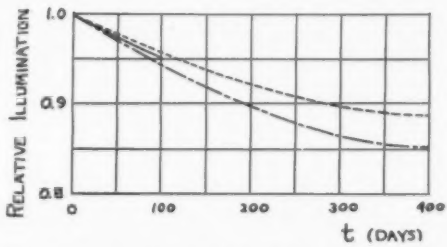

Figure 4. Maintenance factor for a luminous ceiling in a machine shop with lamps operating 3 to 4 hours per day.

——— Experimental data
– – – – Theoretical curve (lamps operated 3 hrs. per day)
— — — — Theoretical curve (lamps operated 4 hrs. per day)

Measurements covering a three-month period, Fig. 4, show the illumination after 91 days to be 96 per cent of the initial value. (The lamps had burned about 200 hours during the preparatory period while installation and painting were completed.) Since this is in close agreement with theoretical results[6] we can be reasonably confident that an average maintenance factor of 87 per cent (based on washing the plastic every two years and replacing lamps when they burn out) is a conservative value, provided the plastic is properly treated with an anti-static compound and the ceiling construction is completely enclosed.

These experimental results indicate that "breathing" is not an important factor in a luminous ceiling installation. The amount of "breathing" of a luminaire depends on the difference between the air temperature in the luminaire and the temperature of the air in the upper part of the room. Measurements made on the luminous ceiling of the machine shop showed that the air in it is only one degree F above the air in the room, while typical enclosed commercial luminaires give corresponding temperature differences of 40 degrees to 50 degrees F. It is probably the cool operation of the large enclosure which accounts for the surprisingly good maintenance of luminous ceilings.

According to a report of the Underwriters' Laboratory[7] the type of material used in this installation does not propagate flame. The Factory Mutual Laboratories[8] in Norwood, Mass. conducted a test in which a 20 x 20 ft room was covered with this plastic. Sprinklers operating automatically at 160°F were located two feet above the plastic, directly on the ceiling, and thermocouples recorded the temperature at various points above and below the plastic. The Laboratories concluded:

Luminous ceilings of corrugated Marlux sheeting, installed under main ceilings below light fixtures and

sprinklers, have no appreciable adverse effect on the operation or distribution of automatic sprinklers. In event of fire it can be expected to soften and drop from supporting rails at relatively low temperatures or to be brought down by the sprinkler discharge.

The third possible objection is the cost of the luminous ceiling. To evaluate this question, we have estimated (Table III) the comparative cost of a luminous ceiling and of the industrial grid system suggested by the I.E.S. Committee on Lighting for the Machining of Small Metal Parts.[1] These results show that even on the cost basis, the high-quality lighting provided by a luminous ceiling is practicable today.

TABLE III.—Comparative Lighting Designs for a Machine Shop.

Height	12 ft	Wall reflectance	0.50
Length	50 ft	Ceiling reflectance	0.80
Width	50 ft	Floor reflectance	0.30

	Grid of Industrial Reflectors	Luminous Ceiling
Efficiency	0.70	0.70
Interflectance	0.97	0.98
Coefficient of utilization	0.68	0.687
Maintenance factor	0.62	0.87
Coefficient of utilization (including maintenance)	0.42	0.600
Quantity of light	89 lumen ft^{-2}	89 lumen ft^{-2}
Power load	4.29 watt ft^{-2}	2.98 watt ft^{-2}
Cost	$1.26 ft^{-2}	$1.76 ft^{-2}

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Lighting a Church

The old lanterns in the St. Killians Church, Chicago, Ill., are now for decoration only. The new lighting installation provides 500-watt downlights placed on the far side of the roof trusses. With no attic above for relamping, these downlights were mounted on automatically disconnecting hangers. Wall urns using 150-watt reflector lamps furnish the upward component of light. Photo courtesy of Chicago Lighting Institute and Rambusch Decorating Co., New York.

Fluorescent Lighting in the Home—Part II

By E. W. COMMERY
KAYE A. LEIGHTON

THE over-window valance with lighting incorporated in it began some years ago, built around the tubular incandescent lumiline lamp. The earliest installations were employed to create a decorative effect with naturalness. The idea was suggested by association with the window.* The desire for cove lighting must have played a part in its creation. This desire has existed in the minds of many families. It has never died out and it is still asked for almost any time the family wants to do something beyond the ordinary. Original installation cost, and the lower and lower ceilings in new houses are not favorable for cove lighting in a great segment of homes. Other lighting factors such as dark ceiling areas and dullness of effect also make its general use questionable, especially in larger rooms.

The lighted window-valance represents the first satisfactory overall answer to the desire for cove lighting for the greatest number of homes. Since its total running footage is substantially less than a cove on two walls, the window valance cost brings this form of lighting within the reach of those seeking the cove. Its lighting distribution, featuring the windows is much more vital, and since it does not suggest that it is going to evenly illuminate the ceiling, it cannot disappoint. Much of the reflected light comes from the large vertical surface below the valance. In this way pleasant cross lighting is brought into the room. This distribution is enlivening to the interior and the occupants. The effect is achieved without introducing obvious lighting mechanics into the home.

At first it was difficult to gain acceptance for the valance face-board out from the wall as much as the now recommended six inches. Valances out this far in conjunction with narrow windows that do not extend beyond the window substantially on each side, do feel as though they were projecting out too far. As the length of the valance increases this unusual depth effect becomes less and less noticeable. See Fig. 1 for valances which extend beyond the windows.

After that the question of how high or wide the face-board could be arose. As time has gone on the width has been increasing to such a point that we need to re-examine this design question. The six-inch vertical width is a good balance between lamp shielding from below and functional effectiveness as measured by the delivered illumination at furniture placed near the wall and below the valance. It might be said that these dimensions in Fig. 2 provide the maximum of utilization effectiveness and a good balance of overall appearance. As the lower edge of the valance is extended further down, the tube remaining in the original top position for maximum spread of light out on the ceiling, the downward light is narrowed in spread, and the quantitative illumination values below the valance decrease.

Many factors defeat the effectiveness of the lighted valance. The fabrics used at the windows, their bulk, their design and color, the type of pleats used and their hanging are of first importance. Bulky materials and dark materials should be avoided. Today's market carries too many high contrast, large figured, dark and even black background drapery fabrics for this purpose. We have found it difficult to locate recent installations that have not made serious mistakes in the selection of materials, in the type of pleats used, and in the location of hanging. Cartridge pleats should always be used, and the traverse track should be below and behind the lamp tube, otherwise there is a blocking, and a great waste, of downward light. A well designed group of valances or several of substantial length can be functionally effective, as well as being forceful in creating desirable lighting effect.

Rooms of many sizes and character respond to the space changing qualities of their lighting effects. Even the moderate sized house of 1000 square feet of living space can be transformed to a "larger" house through their use. An example composed of a living-dining room and a bedroom in a 975 square foot house indicates the possibilities. The former is presented as seen when stand-

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Part II of a paper presented at the National Technical Conference of the Illuminating Engineering Society, August 21-24, 1950, Pasadena, Calif. Part I appeared in the December 1950 issue of ILLUMINATING ENGINEERING. The authors are Head of Residential Lighting and Residential Lighting Specialist, Engineering Division, Lamp Department, General Electric Co., Cleveland, Ohio, respectively.

*Commery, E. W., "Modern Lighting in a Modern House," ILLUMINATING ENGINEERING, Vol. XXXII, No. 9, p. 946 (November 1937).

Figure 1. The living-dining room of the small home, see floor dimensions in Fig. 4, gains spaciousness and aliveness from the full size valances at each of its three windows. The cove on the inside walls gives lighting balance. Reading light at the davenport is developed at the base of the bookshelves.

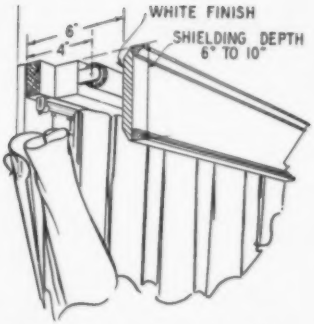

Figure 2. The arrangement and dimensions of parts shown have provided the most effective and satisfactory lighting results for general service over-window or wall-to-wall valances. Each part of this design has evolved from the experiences of previous designs. The ballasts are located in the metal channel back of the lamp. The valance upper edge should be kept below the ceiling a reasonable distance, preferably not less than 10 inches. The installations shown in Figures 1, 3, 5, 6, and 7 use all of the construction dimensions shown.

ing at the front entry (camera position A) in Fig. 1. Refer to the floor plan Fig. 4 for the valance and cove locations and the lamp sizes used. The front window and its valance is shown (camera position B) in Fig. 3. The twelve fluorescent lamps used in the valances and cove, and the one over the davenport supply 16,600 lumens. The disposition of this number of lamps and the light they generate present no structural or visual adaptive problems, even though the spaces are small. Without effort the room has overall lighting balance. Modeling shadows remain and the light and shade patterns free the room from the monotony of evenness. The maximum lighting values are near the walls where they are the most effective functionally. It should be noted that a

Figure 3. Draperies and valances are carried beyond the windows to provide openness. Floor and table lamps supplement the lighting at important chairs.

Figure 4. Floor plan of the living-dining room shown in Figures 1 and 3. The length of windows and valances illustrate the relation between the two.

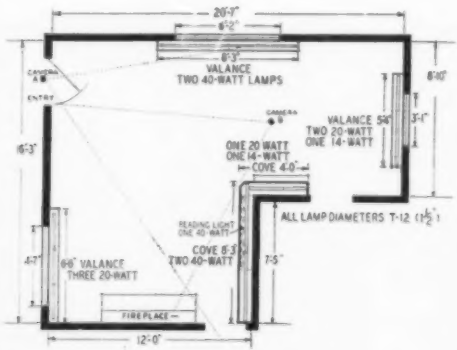

Figure 5. The corner windows of the small modern house are made a unified source of light through the two-unit valance.

Figure 6. Lamps concealed behind the seven-foot wall-valance supply general room lighting, an interesting pattern of light on this main wall, and light for bed-reading.

balancing cove using the same face-board design as the valance is located on the two inside walls back of the full length cabinet, and shelves, and the davenport. Where the more exacting visual requirements are pursued appropriately scaled and placed, floor and table lamps are used. When chairs for reading are not within the range of the direct light from the valance, floor or table lamps are also used. Both chairs in Fig. 3 are outside the range of the direct light from the valance over the window. The spread of direct light below the valance extends out from the vertical through the lamp about 45 degrees.

A sense of space, lightness and airiness are created through the use of the long lines of light, light walls, ceilings and floors, and draperies with light backgrounds. Note in particular how the valances and the lamp tubes in Fig. 4 always extend beyond the window frames substantially. This creates openness, and since most of the drapery in the open position lies on the wall on either side of the window the full window width is left unobstructed for the admission of daylight. The method of going beyond the window frame frees the design problem of fitting many window sizes to lamp lengths that do not match.

Without the floor and table lamps the walls and ceiling range from 3 to 5 footlamberts excluding the values at and above the valances. These show maximums around 100 footlamberts. The illumination down the center of the room is ten footcandles. Under the valances this value rises to nearly 20 footcandles. Reading at the davenport is supplied with 20 footcandles, by adding a polished reflector this value increases to 35.

Two views in one of the bedrooms of the same small house are shown in Figs. 5 and 6. The corner window valance and its companion over-bed wall-bracket are handled with a flair to indicate the individuality of treatment the valance can be given. The corner window valance contains three 20-watt T-12, and one 14-watt T-12 fluorescent tubes. The over-bed wall-bracket contains two 30-watt, T-8 lamps. It is 74 inches long and has its bottom edge 30 inches above mattress level. The chair under the window receives 15 footcandles and the bed reading-plane receives 20. The average ceiling brightness is 3 footlamberts. The maximum values over the windows and wall-bracket are 75 footlamberts. The lamps at the dresser are required to supply the recommended value of 20 footcandles on each side of the face.

Where room design permits, the wall-to-wall valance is functionally much more effective than the over-window type. When the valance construction does not have to be fitted to the windows or limited by them, it offers a very direct and effective means of creating luminous walls. In fact this method of introducing light into a room over large areas feels less labored than many of the other design efforts of the past. For example four 40-watt fluorescent lamps back of a wall-to-wall valence spread approximately 8000 lumens over sixteen feet of wall and ceiling. The simplicity with

Figure 7. This stage display unit shows the wall-bracket on the end wall, and the wall-to-wall valance terminating on the left. Each serves the small modern house in creating visual comfort.

Figure 8. This low ceilinged room 7 feet 4 inches is lighted entirely by the use of large type fluorescent wall-brackets. The units range in size from 4-foot to a 12-foot unit shown at the far end of right hand wall. Luminous shielding of opal glass is in related brightness to the background wall areas.

which this is accomplished is significant. With it we create washes of light instead of pools of contrasty lighting.

Fluorescent Lamp Wall-Bracket

From the basic form of the valance we may develop the fluorescent wall-bracket. The end wall in Fig. 7 shows the type built around a 25-watt, 33-inch fluorescent tube. This illustration also shows one end of a wall-to-wall valance which spans the front wall of the living-dining room. In cross section the wall-bracket is exactly the same as Fig. 2, except the traverse track and draperies are left off.

Assembled in various lengths they can be used with great effectiveness for low ceilinged recreation rooms. When possible they are placed on the two longer dimensioned walls. Here they are placed with lamp centers 72 inches above the floor (see Fig. 8). Other arrangements of placing are, of course, open to the designer. Again they provide a means of supplying washes of light to walls and ceilings instead of pools of light. They can establish the lighting key for a room as well as providing illumination values along the walls in the order of 20 footcandles.

This fundamental form can also be used for brackets over beds, mirrors and even ranges in the kitchen for real functional effectiveness. The over-bed and range applications should be around 51 and 58 inches above the floor respectively.

Figs. 9 and 10 show a minimum size wall-bracket designed for slimline lamps. These are less effective functionally. They do, however, supply lovely washes of light. The room in Fig. 9 uses two such brackets, one six feet long on the left hand wall, and one eight feet long on the right hand wall. Unlike the earlier wall-brackets, which sprung from candle and oil lamp sconces, this bracket can be placed in the middle of wall spaces without usurping the space for pictures. It may be noted that the lamp is much closer to the wall than is shown in Fig. 2. This would suggest higher wall brightness immediately above this smaller cross section bracket. The lower light output per foot of tube from the six- and eight-foot slimline lamps, when compared with the larger diameter 40-watt fluorescent lamp, reduces this brightness problem. The wall brightness above these slimline lamp sizes operated at 200 ma is about 30 per cent less.

Coves

The available lengths of fluorescent lamps make it possible to create cove lighting with fewer breaks of light than formerly. To minimize shadows at sockets have the tubes out from the wall four inches just as shown in the valance drawing Fig. 2. This valance section drawing is a good one to follow in every respect. All that needs to be done is to close the bottom. The vertical depth can be decreased as desired. A white cove interior improves the efficiency and also assists in reducing the shadow that is formed at the ends of the lamps. Either general service or slimline fluorescent lamps can be used. The latter, through the original choice of ballasts, can be designed for one of three different levels of light.

Ceiling Cornices

The lighted ceiling cornices shown in three rooms Figs. 11, 12 and 13 are developed to meet certain physical conditions and to supply a somewhat different overall lighting sensation. They are not as functionally effective as the forms discussed previously since they are closed at the top and held closer to the wall, these changes interfere with the free delivery of light below to a greater degree. They do create a somewhat greater emphasis of the wall, and hence are somewhat more dramatic. Perhaps it may be said that it represents a more luxurious use of the idea of wall lighting.

In the room illustrated the ceilings were less than eight feet and the tops of the windows are but three inches down from the ceiling. To retain the full view of the window from the inside, the bottom edge of whatever is used above the win-

Figure 9. The simplicity and lighting effectiveness of this new form of wall-bracket offers much that has long been sought in the residential interior. Sections of "cove lighting" are created with a single slimline fluorescent lamp and the accompanying simple fixture. Using single lamps these fixtures can have a variety of lengths from approximately four to eight feet. This basic form may be interpreted in many variations of shield design.

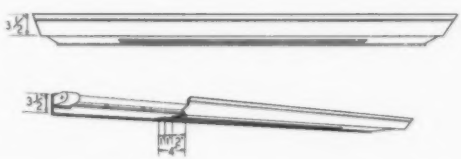

Figure 10. Shows the much smaller cross-section wall-bracket with the bottom closed except for the narrow slot. This reduction in size is possible since the ballast which is contained in the wiring channel of Fig. 2 is now carried in a separate box in the attic space or in an adjacent closet. This wall-bracket is five inches longer than the six-foot slimline lamp which it conceals.

Figure 11. The lighted wall produced by lamps concealed behind the ceiling cornice becomes a principal source of diffused light with a dominance of direction. Any wall and its related furniture can be made the feature of a room with this method. One row of slimline fluorescent lamps supply the lighting. See Figure 9 for the wall-brackets used on the two adjacent walls. Table and floor lamps are placed at important furniture groupings.

Figure 12. Shows the ceiling cornice applied to the four sides of this room, 10 feet wide and 8 feet deep. Each wall is illuminated by one slimline lamp i.e., 8 foot lamps on the longer walls and 6-foot lamps on the other two. At the opening between the living room and dining room the cornices of each meet and become double. Table top illumination, without fixture 5 footcandles.

dow, must be kept high. In these rooms this is accomplished by beginning at the ceiling and coming down with a cornice shield. In Fig. 11 the cornice extends down seven inches. To this is added a box pleated flounce making the total ten inches. The single row of T-6 slimline lamps are mounted on the ceiling and seven inches out from the wall behind the cornice. This assures a very high degree of shielding and a good distribution of light on the wall. There are four 42-inch and one 64-inch lamps operated at 200 ma.

The wall brightness is 40 footlamberts at the top. Its reflectance is 55 per cent. The value decreases gradually to 2 footlamberts at the window sill. The illumination at the floor center is one footcandle. The illumination for reading is 10

Figure 13 (right). Here the wall-to-wall mirror and wall-to-wall ceiling cornice complement each other. The mirror becomes a luminous transparent crystal solid without introducing false images or reflections of the lamps. Functionally, it supplies 20 footcandles for reading. Two 8-foot slimline lamps end to end operated at 200 ma are used. See Fig. 14 for design detail.

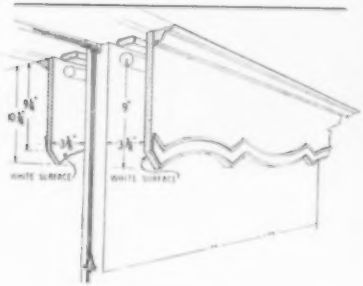

Figure 14 (left). The ceiling cornices of Figures 12 and 13 are shown here as they exist alone in each room and together at the opening between the two rooms. The drapery has been removed for clarity.

footcandles. If the lamps are moved toward the wall two inches this value is approximately doubled.

The views of two adjacent rooms Figs. 12 and 13 show another handling of the ceiling and window height problems just discussed. Here the cornice is held even closer to the wall although the lamps are moved from the back of the cornice one inch more than in Fig. 11. The upper wall brightness has increased while the downward functional effectiveness at the davenport has improved. The sensation in the dining room is one of softness and far greater spaciousness than the dimensions of the room indicate. The average brightness, omitting the higher brightness on upper-wall, is two footlamberts. The delicate tracery in the wall covering combined with the subtle gradation of light from cornice to floor creates fanciful qualities that only come from the appropriate and skillful handling of light and materials.

Alcoves and Soffits

The planned alcove and soffit offers natural forms of construction for lighting built into or applied to the interior. They provide locations for such major pieces of furniture as davenports, desks, pianos, beds, dressers and dressing tables. At the same time the overhead soffit provides the space for light sources. The low brightness of the fluorescent lamps does not make it necessary to glaze these soffits with high diffusion light absorbing glass. Instead, crystal-frosted-glass or one of the large fluted prism crystal glasses is used. The light transmission of these glasses is high. The form of the soffit face is usually rectangular, hence the natural long dimension of the fluorescent lamp and the soffit complement each other. The high transmission glass and the high efficiency of the fluorescent lamps practically eliminate problems of heat. For handling larger area localized lighting problems where softness and good quantitative values are required, it is a part of today's best lighting tools.

The designer must always recognize that small glass areas do not suffice. The lumen values of the light-sources must become a part of the design data. In this way the dependable results are achieved. There is no other way. Many of the current designs encountered in homes show an almost complete lack of understanding of the elementary principles involved. Two rows of lamps are always desirable, and their length should approximate the length of the alcove. The cavity of the soffit should be high in reflectance. The distance between the bottom face of the soffit and the main area to be illuminated, such as the kitchen sink, desk top, book being read in bed, etc., is between four and five feet. The two rows of lamps *without* polished metal directive reflectors in these examples will supply around 30 footcandles directly beneath. The directive reflectors aimed

Figure 15. Important elements of furniture such as davenports, desks, pianos, beds, dressers and dressing tables may be lighted with finesse and high functional effectiveness when placed in the planned alcove. Two rows of fluorescent lamps and separate switches for each offer a choice of decorative functional lighting.

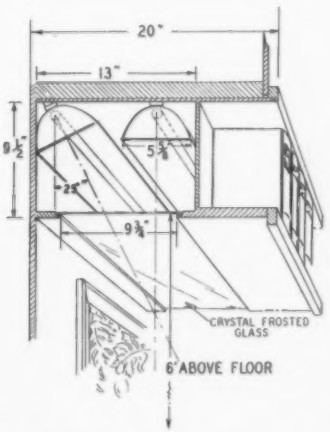

Figure 16. Showing a section through the soffit and alcove of Fig. 15. The floor space on either side and above the alcove can be designed for utility or decorative purposes. The space need not be sacrificed. In this case books are arranged in front of the soffit and on each side of the alcove.

Figure 17. Large-area, low-brightness louvered ceiling areas can be included in the home to provide a new order of spaciousness and luminosity. There are no dark days or labored hours ahead when an interior contains patterns of light such as this. Louver brightnesses are from 60 to 100 footlamberts. Upper cabinet and refrigerator brightnesses 30 footlamberts. Room center over 90 footcandles. Four 8-foot slimline "standard" cool white fluorescent lamps operated at 200 ma are used.

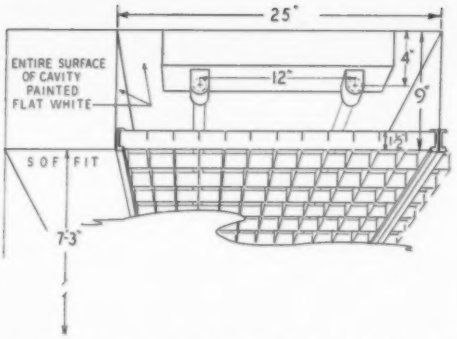

Figure 18. The depth of cavity, and one unit-width of lamps and louver employed in Fig. 17 are shown. The unit 25 inches by 49 inches is composed of an outer metal holding frame and cells that are 2 inches by 2 inches and 1½ inches deep. Four of these are grouped together in the accompanying kitchen.

downward will double this value. In Fig. 15 there are two rows of lamps as shown in Fig. 16. These dimensions exclusive of the lamp placement are indicative of the cross section size of a good functional design. Each row of lamps can be on separate switches. This way one row can be used for decorative lighting and the second row added for both decorative and functional purposes. In Fig. 15 the back row is tilted to aim its light on the book of the reader seated on the davenport. Without the reflector the illumination is 15 footcandles. With the reflector it increases to 30 footcandles. The row aimed down adds 10 footcandles out at the reading position, and also fills in the entire back of the alcove. The glass brightness when viewed from near seated positions averages 80 footlamberts. The wall brightness ranges from 5 to 10 footlamberts with walls of 50 per cent reflectance.

The use of both cool and warm fluorescent lamps in the same room was briefly indicated when the trend toward whiter light sources was discussed. The alcove with its lighting soffit conveniently isolates the color of the light used in it from the rest of the room. The illustration for Fig. 15 was made somewhat darker than the actual condition to bring out this point. The alcove also runs substantially brighter than the general wall areas surrounding it. The choice of warm or cool white light used in it will, therefore, withstand dilution or change when the light in the room of which it it a part differs from it. In this instance cool white lamps are used in the alcove to obtain the natural outdoor qualities in the painting and to hold the coolness of the ice blue davenport. The room is lighted with warm fluorescent lamps.

Louver Ceilings

The luminous ceiling approximates the sensation of a cheerful sky indoors. Earlier efforts to obtain this expansiveness required heavy construction to hold the necessary large areas of diffusing glass. A multiplicity of lamps and sockets were also needed. Just the handling of elements of this size are beyond the facilities and the mental attitude of the typical household. This has changed. Prefabricated louvers of paper, plastic and thin metal provide the basic shielding and diffusing materials from which the entire sub-ceiling may be assembled. These materials are not overwhelming when handled. The installation in Fig. 17 illustrates the basic points of design where a substantial part of the ceiling — 4 feet wide and 8 feet long — becomes the source of light. This approach is applicable to either new or existing homes.

By referring to Fig. 18 the positioning of the fluorescent tubes, ballast box, louver frame, louver and ceiling height is shown. In this installation we begin with the widely used ceiling height of eight feet. This brings the bottom of the louvers and

TABLE VI.—Designers' Fluorescent Lamp Table.

For ready reference in installation design, workable combinations of general service fluorescent lamps (T-12), and slimline fluorescent lamps (T-6 and T-8) are tabulated to fit various lengths.

GENERAL SERVICE

Length of Combined Lamps Including Lampholders	(T-12) Number of Lamps 15-w	20-w	25-w	40-w
1′ 6″	1			
2′		1		
2′ 9″			1	
3′	2			
3′ 6″	1	1		
4′				1
4′ 3″	1		1	
4′ 6″	3			
4′ 9″		1	1	
5′	2	1		
5′ 6″			2	
5′ 9″	2		1	
6′		1		1
6′ 6″	3	1		
6′ 9″			1	1
7′	1		2	
7′ 6″	1	1		1
7′ 9″	2	1	1	
8′				2
8′ 3″			3	
8′ 6″	2		2	
8′ 9″		1	1	1
9′	1	1	2	
9′ 6″	1			2
10′		1		2
10′ 6″	3	1		1
10′ 9″			1	2
11′	2			2
11′ 6″	1	1		2
11′ 9″	1	1	3	
12′				3

SLIMLINE

Length of Combined Lamps Including Lampholders	(T-6) Number of Lamps 42″	64″
3′ 6″	1	
5′ 4″		1
7′	2	
8′ 10″	1	1
10′ 6″	3	
10′ 8″		2
12′ 4″	2	1
14′	4	
14′ 2″	1	2
15′ 10″	3	1
16′		3
17′ 6″	5	
17′ 8″	2	3
19′ 4″	4	1
19′ 6″	1	3
21′	6	
21′ 2″	3	2
21′ 4″		4
22′ 10″	5	1
23′	2	3
24′ 6″	7	
24′ 8″	4	2
24′ 10″	1	4
26′ 4″	6	1
26′ 6″	3	3
26′ 8″		5
28′	8	
28′ 2″	5	2
28′ 4″	2	4
29′ 10″	7	1
30′	4	3
30′ 2″	1	5
31′ 6″	9	
31′ 8″	6	2
31′ 10″	3	4
32′		6

Length of Combined Lamps Including Lampholders	(T-8) Number of Lamps 72″	96″
6′	1	
8′		1
12′	2	
14′	1	1
16′		2
18′	3	
20′	2	1
22′	1	3
24′		3
24′	4	
26′	3	1
28′	2	2
30′	5	
32′		4

Lampholders — should be butted end to end in continuous runs. The doing of this will prevent spottiness (low brightness areas) between lampholders.

Ballasts — for Slim'line Lamps can be obtained for operation at one of three different light output (lumen) values. These three values are obtained by operating the lamp at different current values, 120, 200 and 300 milliamperes. Specific ballasts are designed for each of these three operations, selection is based on the lumen value required for the desired lighting effect. Consult manufacturer's data sheets for detailed information. Include specification of selection on design layout to insure correct installation.

the surrounding soffit on all four sides down to 7 feet 3 inches. Door heights and the tops of cabinets in modern kitchen design are about seven feet above the floor. The new ceiling is, therefore, at its lowest practical position. When the ceiling height of the room is greater than eight feet, the cavity for the lamps and louvers remains about the same depth, *i.e.*, nine inches. This, however, permits a higher position for the bottom of the added subceiling. In either the new or existing house the regular plastered ceiling is used for the upper surface of the entire cavity. The soffit is merely added on the four sides to fit the unit louver sizes, and to close and level the space out to the walls of the room. The complete cavity opening is 50 inches wide and 97 inches long.

If multiples of the louver frames go beyond the tops of the cabinets in kitchens, but not out to the walls it becomes possible to run from wall-to-wall with the louvers without constructing plastered soffits. Dimensions of rooms can also be adjusted in the planning, so as to run the louvers from wall-to-wall without added soffits. Only a trim molding would be needed on the walls for resting the frames, and for finishing off this wall-to-louver frame junction.

This construction is applicable to various other spaces in the home where the building ceiling is not substantially lower than eight feet. The room so illuminated takes on a feeling of unusual spaciousness, and since the louvers are luminous the louvering of the ceiling does not "press down" on the occupants. The illumination levels obtainable with a high order of visual comfort are above and beyond those resulting with any other methods that have been studied. The kitchen illustrated is supplied with nearly 100 footcandles in its center, and 35 footcandles at the outer work counters. Four eight-foot T-10, slimline standard cool white fluorescent lamps operated at 200 ma are used. At the sink and range additional localized lighting is included in this particular design.

At the beginning of this paper* it was suggested that the fluorescent lamp can do things for

*Part I, published December 1950.

the residential interior that were scarcely ever attempted before. These glimpses of some of the practices that can be employed by any one familiar with residential construction and electrical wiring illustrate the simplicity of working with this new light source. For the first part of the last ten years it was believed fluorescent lighting applications would be limited to the utilitarian parts of the home. The color of the light introduced new problems and the shape of the lamp did not seem to be adaptable in the home field.

The great advance in the color rendition qualities of the lamps now available and discussed herein show that we can select the type of fluorescent lamp we wish for such color rendition as we may choose. If we wish we can achieve excellent color rendition without introducing color filters or other devices for modifying the quality of the light. While these possibilities and others to come are open to homes of all sizes it is very significant that the small home that exists and is being built in such great numbers today, can benefit so greatly from the ideas presented.

Acknowledgments

The authors wish to express appreciation and give credit to the following members of the Engineering staff for their part in preparing the paper: Dr. A. H. Taylor for data and assistance given in connection with color filters ("Bn"), Charles N. Clark, computations for the use of illuminant "Bn," Aileen Page, computations; Helen Bolz, proofreading.

Highlighting a Service Station

A new service station has been completed and placed in operation in Amarillo, Texas, by the Shamrock Oil & Gas Corp. At night the station demands a second look with its green and white colors highlighted by large floodlights, sign reflectors, and fluorescent pylon standards. Inside, the office and display area have fluorescent ceiling fixtures with eggcrate louvers. Nine 150-watt flush mounted units supply added light for displays of tires, oils and accessories. In the lubrication and washing rooms dome reflectors and floodlights line the perimeter of the area. Mounted flush in the floor are two 200-watt service lights with refracting lens and guards, which flood the under side of a car when it is raised on the mechanical lift. A reverse pylon fluorescent bracket is mounted on the wall between washing and lubricating areas.

Illumination averages 70 footcandles for office and selling area, with over 100 beneath the spot fixtures. In the washing room and lubrication room, the average is 26 to 30 footcandles. Outdoors on the driveway near the pumps the floodlighting ranges from 2 to 8 footcandles.

Duke Electric made the installation of lighting on recommendations by Tom Lynn of the Southwestern Public Service Company.

Luminous Ceiling Control Room

LIGHTING OBJECTIVE: To provide shadowless illumination on all instruments without annoying reflections in their glass covers.

Installation at Barbadoes Island Generating Station, Norristown, Pennsylvania (Philadelphia Electric Company)

General Information: Colors, reflectances and brightnesses of this 72′ x 39′ room are as follows:

Area	Color	Reflectance (per cent)	Brightness (footlamberts)
Sidewalls	light buff	57	10
Switchboards	light aluminum	40	8
Floor	light gray asphalt tile	25	5
Ceiling	(Plexiglass)	—	40
Furniture			
Tops	dark green	7	3
Sides	gray	14	2

With the exception of one small 24″ x 42″ panel, the room is windowless. All meters within the operators' field of view are equipped with non-glare glass.

(over)

A.I.A. File No. 31/14

Mounting Details

Installation: Lighting is provided by 192 93-inch 25 mm cold cathode lamps equipped with Salneu right angle terminals and operated in series at 100 ma. These lamps are mounted in pairs 17 inches above a Plexiglass ceiling. The pairs of lamps are spaced on 36-inch centers; adjacent lamps are on 14-inch centers in the terminal boxes.

Plexiglass sheets 36" x 36" x ¼" are suspended 11 feet above the floor in a T-iron framework. The upper side is polished and the lower grit-sanded to produce a diffusing surface. Both sides are treated with antistatic wax (Permag, manufactured by Magnusen Products Co., Brooklyn, New York) to minimize the accumulation of dirt. The space above this ceiling (maximum depth 6 feet), partially filled with pipes and air conditioning equipment, is painted white (75% RF).

Average horizontal illumination is 36 footcandles; vertical, 15. (Brightnesses are tabulated under General Information.) Power consumption is 3.4 watts per square foot. No shadows are evident. The reflection of the framework and ventilating ducts are not noticeable except in the case of several large recording instruments covered with ordinary glass, and these reflections are not disturbing.

Emergency lighting is supplied from four 150-watt PAR-38 lamps suspended above the luminous panels, one lamp to each control panel section. These provide 5 footcandles horizontal illumination from storage batteries when the a-c supply voltage is too low for cold cathode operation.

Lighting data submitted by Arthur A. Brainerd, Philadelphia Electric Company as an illustration of good lighting practice and to aid in the design of similar installations.

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New Photochemical Lamps

By L. E. BARNES

The requirements of photochemical lamps when used in modern whiteprint machines are discussed. A description of new lamps with features such as reduced sensitivity to drafts, higher output, long life independent of number of starts and uniform output is given.

NEW PHOTOCHEMICAL lamps have been developed using a new glass and new electrodes which are better adapted to the operating conditions of modern whiteprint machines. They have higher ultraviolet output, more uniform output because of reduced sensitivity to drafts and longer life which is practically independent of the number of times lamps are turned on.

Two lamps are shown in Fig. 1, the longer one rated at 3000 watts, the other rated at 940 watts. They have one-inch diameter bulbs of 96 per cent silica glass and thorium non-activated electrodes. Electrical characteristics and dimensions are given in Table I.

TABLE I.—Technical Data for New Photochemical Lamps.

	C-H9**	A-H14
Bulb	T8	T8
Operating Volts*	535	250
Operating Amperes*	6.1	4.2
Operating Watts	3000	940
Maximum Overall Length	56"	21 1/2"
Lighted Length*	49"	14"

*Approximate.
**Interchangeable with B-H9 with slight adjustment of socket spacing. Will operate from standard H9 ballast.

Ultraviolet Output

Diazo compounds used as the sensitized paper emulsion in whiteprint processes have a spectral sensitivity in the ultraviolet region adjacent to the visible spectrum (See Fig. 2). The 365 millimicron mercury line is close to the 380 millimicron wavelength of maximum sensitivity. A medium pressure mercury arc is used to obtain the best efficiency of output in this spectral region. High operating temperatures are necessary to vaporize the mercury. In the past, high temperature glasses such as Corning #9730 and fuzed quartz have been used for arc tubes.

The transmission of #9730 glass at 20°C and 500°C is graphed in Fig. 3. At 500°C the transmission curve is shifted approximately 20 millimicrons toward the longer wavelengths. As seen from the curve, the transmission at 365 millimicrons when the operating temperature is 500°C is only 75 per cent. Thus, #9730 glass is suitable for low temperature (low pressure) lamps but the lower transmission at high temperatures makes it less desirable for high pressure lamps.

The use of quartz for an arc tube gave high transmission in the 365 millimicron region but presented a problem of ozone. The transmission of quartz as seen in Fig. 3 extends below 185 millimicrons. Radiation in this region has the ability to produce ozone from oxygen. Ozone is a very toxic gas and the National Bureau of Standards recommends a concentration of less than 0.5 parts per million for comfort and safety; therefore, it was necessary to remove the ozone by way of ducts to the outside air or to enclose the arc tube in an outer glass envelope. The envelope was generally made of Pyrex #7740 glass which cut off the low wavelengths, thus eliminating the formation of ozone. The Pyrex envelope did not operate as hot as the arc tube and much of the high transmission of fuzed quartz could, therefore, be utilized.

Figure 1. 3000-watt, 56" C-H9 lamp and 940-watt 21½" A-H14 lamp.

A paper presented at the National Technical Conference of the Illuminating Engineering Society, Pasadena, California, August 21-24, 1950. Author: Lamp Engineering Development, Westinghouse Electric Corp., Bloomfield, N. J.

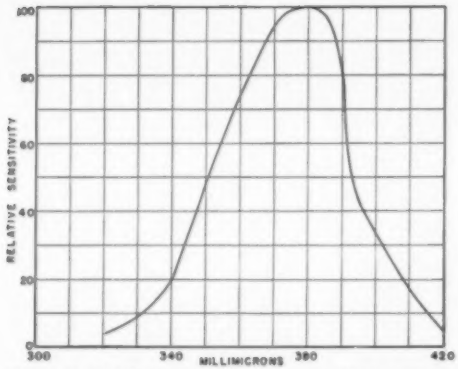

Figure 2. Spectral sensitivity of basic diazo emulsion, courtesy Charles Bruning Company.

The effective ultraviolet output was less than for a quartz lamp but more than for a lamp made only of #9730 glass. However, the gain in output was offset by the cost of the outer bulb and the high cost of quartz.

In recent years a new high temperature glass that is considerably less expensive than quartz has become available. Corning #7911 Vycor has high 365 millimicron transmission at high temperatures and negligible 185 millimicron transmission so that no outer bulb is required to prevent ozone formation. Thus, high output is achieved at lower cost. The new lamps give approximately 50 per cent higher printing speed than comparable lamps using #9730 glass. Fig. 4 gives a comparison of the ultraviolet output of a lamp using #9730 glass and a lamp using #7911 glass.

Sensitivity to Drafts

The sensitized paper should not be heated above 135°F to prevent objectionable blurring due to the difference in expansion of the tracing and emulsion. A rotating glass cylinder placed around the lamp carries the tracing and sensitized paper near the lamp for exposure (see Fig. 5). This rotating cylinder is cooled by a draft which incidentally cools the lamp and may affect its operation.

Mercury vapor lamps operate at a pressure determined by the coolest part of the lamp. If a portion of the lamp is cooled enough, mercury will migrate to this critical spot and condense until equilibrium of condensation and evaporation is reached. In conventional tubular lamps, a critical spot has been the exhaust tip. The projecting exhaust tip has a relatively large area and naturally operates at a lower temperature because the loading per unit area is less. This undesirable condition is further aggravated by the draft because the added turbulence around the projection cools it more than the rest of the bulb. With an exhaust tip it is necessary to position the lamp with the exhaust tip up so that it is at the warmest position of the lamp. To overcome this difficulty, the exhaust tip could have been placed under the base but this proved to be a somewhat clumsy solution. A simple solution was to eliminate the exhaust tip entirely. This was accomplished by a new electrode sealing technique. The elimination of the exhaust tip has not only reduced the problem of lamp operation in drafts but also made it unnecessary to educate consumers to position the lamp with the exhaust tip up.

The new glass permitted a reduction in bulb diameter. This reduced the area of the bulb exposed to the cooling draft thereby reducing sensitivity to drafts still more. The reduction in sensi-

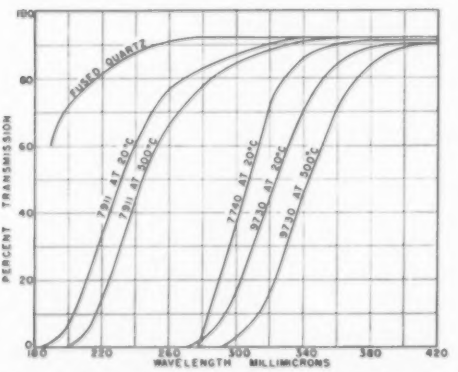

Figure 3. Transmission curves for some ultraviolet transmitting glasses.

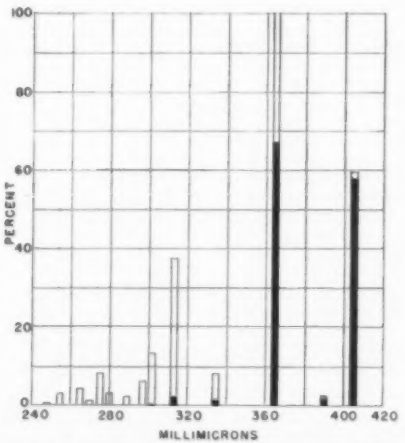

Figure 4. Comparison of ultraviolet radiation from a B-H9 and a C-H9 lamp. Dark portion is relative radiation of 3000-watt T9½ #9730 glass lamp. Light portion is additional radiation of 3000-watt T8 #7911 glass lamp.

tivity to drafts results in uniform output along the length of a lamp and prints with even density are obtained.

Lamp Life

The duty cycle of most photoprinting machines is four hours per start. Some are used for even shorter periods. The small office printing machine, for which the 940-watt lamp was primarily designed, is expected to have a duty cycle of about one hour per start. (See Fig. 6.)

On short duty cycles the life of a lamp is largely determined by the life of the electrodes. Electrodes in some photochemical lamps are of an oxide activated type. This type of electrode has a tendency to sputter the emission material from the electrode when subjected to repeated starts and thus becomes deactivated. The new lamps use a modification of the Gustin-Freeman electrode.[5] This thorium (non-activated) electrode has the advantage of long life practically independent of the number of starts.

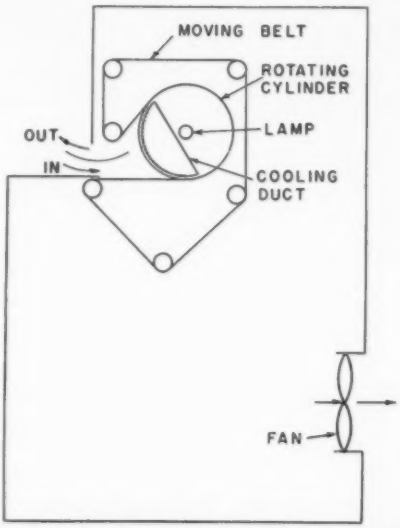

Figure 5. Schematic sketch of whiteprint machine showing cooling system. The fan creates a partial vacuum inside the machine and inside the rotating cylinder. The end of the airduct extends through the side of the machine and is open to atmospheric pressure. The path of the cooling air is from the ends of the duct through the indicated holes in the duct to the cylinder wall to the end of the cylinder to the fan and out.

Conclusion

This discussion has been primarily on the new lamps and their application to the whiteprint process because of the severe requirements of modern whiteprint machines. However, there are many other photochemical reactions which require energy in the wavelengths produced by these lamps. Such features as higher output at reduced cost make it practical to use these lamps as a new tool in many industries.

Figure 6. Small photoprinting machine. Courtesy Charles Bruning Company.

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DISCUSSION

R. E. FARNHAM*: The material presented in this paper is a very worthwhile contribution to the rather limited literature on the subject of light sources for blue and white printing.

There are, however, two points brought up in the paper which may give an erroneous impression unless further clarified.

The author says that diazo compounds, used to sensi-

*General Electric Company, Nela Park, Cleveland, Ohio.

tize whiteprint paper, have a spectral sensitivity as shown in Fig. 2. The caption further states that this is a basic sensitivity charateristic of diazo materials. The curve undoubtedly is correct for the material used by one manufacturer which produces black lines on a white background. It does not necessarily apply to the diazo materials used by other producers of white print papers, particularly those papers giving other than black lines. Various types of papers employing diazo coating have sensitivity peaks ranging from 3500A to above 4000A. While the medium-pressure mercury vapor lamps are undoubtedly the best source for all of the diazo papers, there is frequently a choice between the blue and black-light fluorescent lamps in the case of the lower speed printers.

Mr. Barnes has based his comments relating to the "Sensitivity to Drafts" largely on the influence of the tip as being a cool point, with resulting condensation of mercury vapor, thereby making a strong case for the tipless lamp. Actually, the tip forms a very minor part of the general cooling problem. The real difficulty arises in keeping the mass of air, necessary to cool the paper cylinder to a satisfactory operating temperature, away from the lamp bulb as well as the tip. If the tip is kept within a maximum height of four millimeters, as can easily be done, no difficulties are encountered with mercury condensation at this point.

The exhaust practice, which produces the best quality lamp calls for operation of the lamp at normal or greater than normal current while still connected to the pump. It is not possible, with the tipless construction, to employ this desirable procedure. It is, therefore, often preferable to retain the small tip and thereby obtain a lamp of maximum performance.

L. E. BARNES*: Mr. Farnham's comments on the spectral sensitivity of whiteprint papers using various diazo compounds for obtaining colored lines are quite true. However, if it is considered pertinent to discuss this subject, it should also be noted that the printing speeds of emulsions sensitive to shorter wavelengths are increased more by use of the new lamps than the increase indicated for the emulsion described in the paper.

Mr. Farnham's statements on sensitivity to drafts do not agree with the writer's experience. Most instruction manuals on operation and maintenance of whiteprint machines have a section devoted to placing the exhaust tip up when installing the lamp. It is true that lamps have been made for many years with exhaust tips and machine designers have found ways to use them but the tipless lamp now offers more freedom in machine design. The tipless construction in absolutely no way reduces the quality of the lamp. Mr. Farnham has undoubtedly never compared the tipless lamps described in the paper with conventional lamps. Had a comparison been made data would have been included in his discussion. Though Mr. Farnham may not be familiar with it, there is a method of thoroughly processing electrodes used in the manufacture of these lamps.

*Author.

Fool-Proof Lamp Protectors

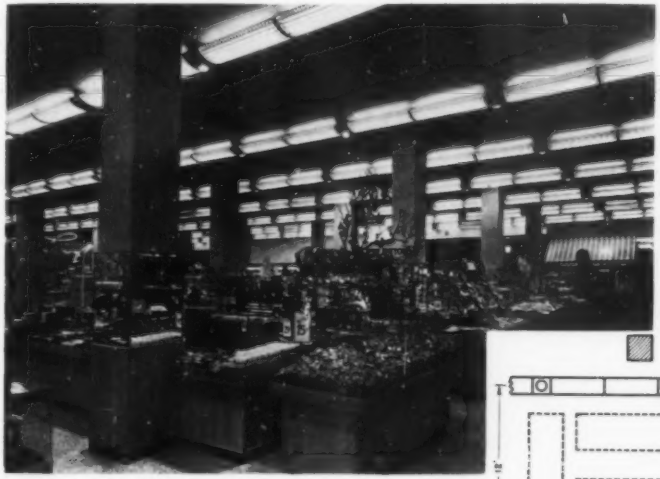
A new kind of metal lamp guard (shown left) is being tested in New York City's principal proving ground — Central Park. The installation is expected to reduce the considerable breakage experienced from young stone-throwing marksmen. More than 40,000 of the City's 170,000 street and park lights have been broken repeatedly, costing taxpayers almost $300,000 per year. The new guards are made of an expanded metal — a material made by piercing and stretching solid sheet, its diamond-shaped openings permitting full illumination. (Photo: Courtesy of Wheeling Corrugating Company, Wheeling, West Virginia.)

A.I.A. File No. 31-14

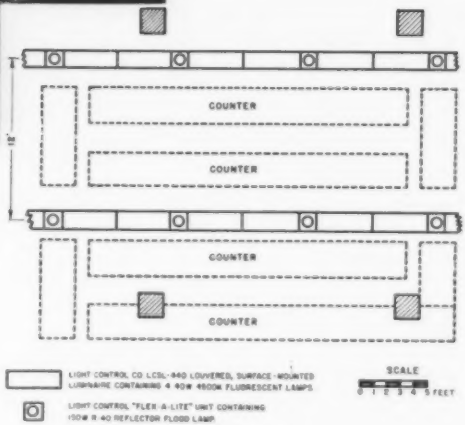
A.I.A. File No. 31/14

Lighting a Store

LIGHTING OBJECTIVE: To provide general lighting and highlight merchandise.



Installation at
J. J. Newberry
445 So. Broadway
Los Angeles, Calif.


COUNTER
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18'
LIGHT CONTROL CO LCSL-440 LOUVERED, SURFACE-MOUNTED LUMINAIRE CONTAINING 4 40W 4600K FLUORESCENT LAMPS
LIGHT CONTROL "FLEX-A-LITE" UNIT CONTAINING 150W R-40 REFLECTOR FLOOD LAMP
SCALE
0 1 2 3 4 5 FEET

Plan View

General Information: Surface characteristics of this "five and ten" are indicated below:

Ceiling	pale green	
Walls	peach	23-33% RF
Columns	dusty rose	45% RF
Counter sides	blond	
Floor	light terrazza	33% RF

Ceiling height is 17 feet.

Installation: Continuous rows of fluorescent luminaires and reflector flood lamps are installed as indicated in the plan view. Resultant illumination and brightnesses are as follows:

Illumination at counter height (40 inches above floor)

Beneath fluorescent luminaire	60 ft-c
Beneath flood lamp	68 ft-c
Between rows	58 ft-c

Brightnesses

Floor	20 ft-L
Columns	
Lower	27 ft-L
Upper	65 ft-L
Ceiling (between luminaires)	12 ft-L
Luminaires	
Fluorescent	
30° crosswise	300 ft-L
45° crosswise	900 ft-L
30° lengthwise	300 ft-L
45° lengthwise	800 ft-L
Flood lamps	1200-1600 ft-L

Lighting data submitted by Illuminating Engineering Unit, Department of Water and Power, City of Los Angeles as an illustration of good lighting practice and to aid in the design of similar installations.

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51 Madison Avenue, New York 10, N. Y.

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Downlighting

By STANLEY R. McCANDLESS

ANY incandescent fixture or instrument which directs its light entirely downward from the ceiling primarily within a 90° angle, so as to be as inconspicuous as possible, can be called an ideal downlight.

It is basically a utility source which by itself or spaced too widely can cause extreme variations in levels of illumination. Downlights must be used in numbers sufficient to offset unevennesses and to minimize harsh shadows when they are distracting.

There should almost always be some general illumination accompanying downlighting. This will reduce contrasts and offset the occasional objection to the highlights on the eyebrows and on the upper rim of spectacles.

If the individuals in a downlighted room all face a definite direction, as in an auditorium, it may be wise to project all downlights forward; slightly ahead of the vertical.

Each type of downlight should be judged on the basis of:

Mr. McCandless is with the Century Lighting Co., New York, N. Y.

Downlighting is a subject of considerable interest today. This paper arbitrarily defines the term so that only relatively small incandescent units used as a group and directing their distribution downward through apertures in the ceiling are strictly called "downlights." There are five groups, each employing similar optical principles and equipment, which can be compared as to output and distribution. The problem of level and evenness of illumination is considered in the various diagrams.

1. Total lumen output (amount of light) and color. Colored light requires higher wattage.
2. Characteristic distribution: cut-off at 45° or glaring when viewed at flat angles. Spacing and evenness of illumination resulting from calculation.
3. Degree of control and flexibility provided. Optical units can be matted or framed to cover a specific area but they are inefficient. They can project their beams through a small hole more efficiently than, for example, a reflector lamp, and as a result they are the least conspicuous of any type.

Most units are strictly limited to a fixed wattage because very few lamps have similar light center

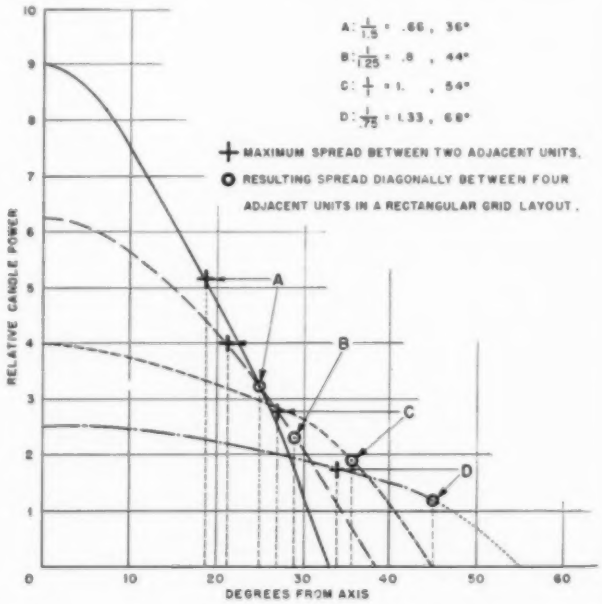


Figure 1. Spacing related to ceiling height. Hypothetical distribution curves of 1000 lumen instruments which will give approximately equal illumination over the working plane from grid of units at x spacing with ceiling heights of 1.5x, 1.25x, 1.0x, and .75x respectively.

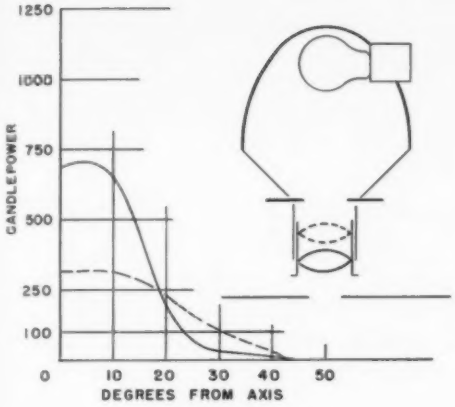


Figure 2A

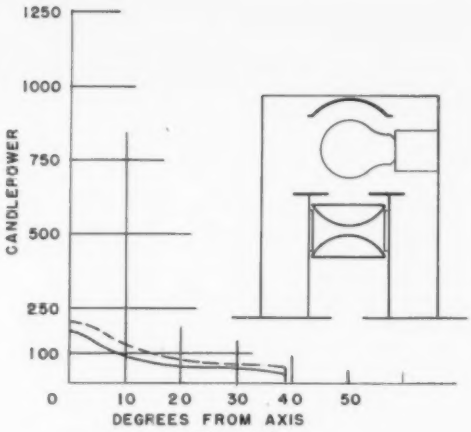


Figure 2B

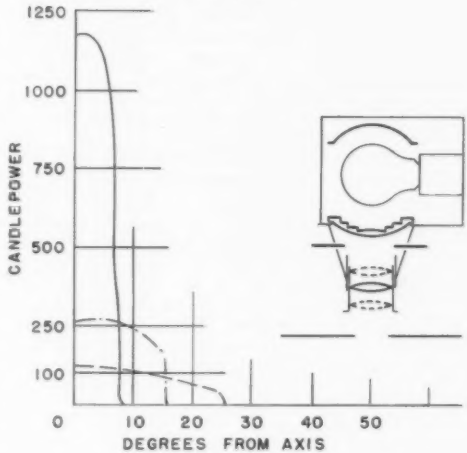


Figure 2C

Figure 2. Optical units called "Pin Spots." Three features — a concentrated filament lamp, an ellipsoidal reflector or a spherical reflector and condensing lens (the latter omitted in B) and an objective system — are used to gather and project the rays through a small hole in the ceiling. In some, framing shutters or templates are used to frame the beam sharply to a prescribed area. On the whole these are the most inconspicuous and least efficient of all downlights, but they give the widest range of control of beam spread to meet a variety of conditions. They are most used individually to light specific areas such as tables with low level of illumination.

2A — The ellipsoidal reflector spotlight. Made in sizes from a 32- and 50-candlepower 6-volt unit with a transformer, one and one-half-inch aperture to a 500-watt (in rare instances 2000-watt) 6-inch lens type 4-inch aperture with beam spreads between 20, solid line and 60 degrees, dotted line, depending on the focal length of the objective lens combination. Corresponding efficiencies of between 15 and 40 per cent are provided. They can be equipped with framing shutters which can shape the beam precisely or they can be thrown out of focus to give soft edge. These units in the large sizes require up to three feet of mounting space.

2B — Pin point unit. The simplest optical system consisting primarily of a concentrated source generally about 100 watts, shutters, and a short focus objective system. The aperture can be less than an inch in diameter but the output is less than 10 per cent. The small source used in this unit limits applications to places where only a low level of illumination is required. The difference in output between the spotlight lamp (200 hours) — 10 per cent and the floodlamp (800 hours) solid line 8.5 is shown in the diagram.

2C — Pin spot unit. Regulation stereopticon set-up from 100-watt to 400-watt sizes generally using a 2-inch diameter objective lens. The beam spreads are similar to Type A. With objective systems made up of one, two and three lenses with 5 per cent, 4.5 per cent and 3.5 per cent corresponding outputs. With the framing shutters closed in, the efficiency may be less than 1 per cent if the objective lens combination produces a beam much wider than is necessary. The aperture is about one and one-half inches in diameter. This gives the most precise control of all three units in this group.

lengths. Socket extensions, adapters and adjustments in lamp mounting are questionable accessories because the layman is bound to use the wrong one when he wishes to change the output of the unit or the illumination from the group. Dimmers are not always practical but they do provide flexibility.

The cost of power, relamping and cleaning over a number of years, should be prorated with the initial costs of installation. These are concrete

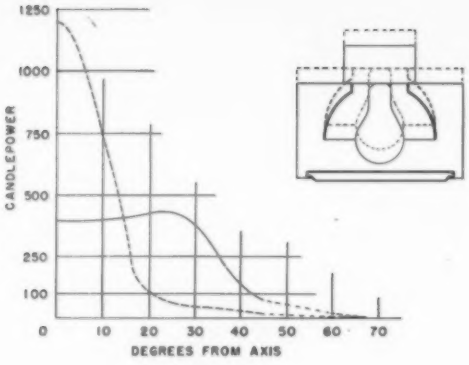


Figure 3A

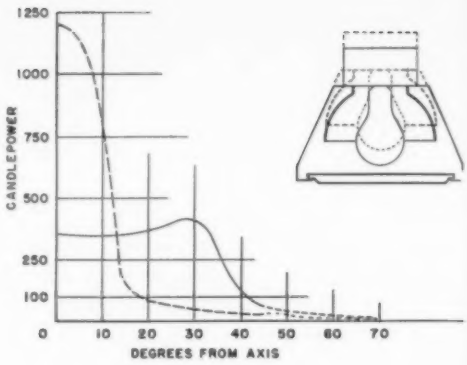


Figure 3B

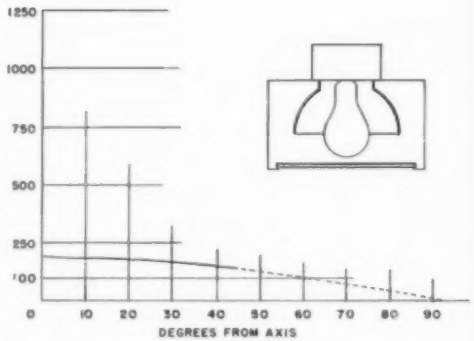


Figure 3C

Figure 3. Flush ceiling plates. Generally flat lens plates of the Fresnel type, either square or round, or diffusing glass. These are characterized by a high surface brightness in the normal line of vision. The focal length is about equal to half the diameter; therefore, it is possible to determine the beam spread by the position of the lamp. It is also possible to produce an asymmetrical beam by offsetting the lamp up to about 25 degrees. Due to reflections from the inside of the enclosing box, the size of the source, internal reflections and out-of-angle refractions in the lens itself, plus the various means of breaking up the beam to prevent filament images, there is always considerable candlepower outside the rated angle of spread. This gives a high total lumen output and an even illumination with wide spacing, but it also tends to create high brightness contrasts and glare. The risers can be opaqued to cut down much of the characteristic high brightness in the normal line of vision without affecting the useful output unduly. The beam spread is determined by the position of the source with relation to the lens.

3A — Round lens plates. Narrow beam, broken line, 15-20 per cent output. Wide beam, solid line, 50 per cent. 3-, 6-, 8-, 10- and 12-inch diameters for lamps up to 500 watts available in 14- and 20-inch diameters made of heat resisting glass.

3B — Square lens plates. Narrow beam, broken line, 15-20 per cent. Wide beam, solid line, 50-60 per cent. 6½-, 8½-, and 12-inch squares for lamps from 40 to 200 (if heat resisting, to 500) watt lamps.

3C — Rectangular or round diffusing glass plates. 60 per cent output. Any size up to 18-inch. The lamp should be mounted at least one quarter the largest dimension of the box away from the glass to avoid a "hot" spot. The distribution is the typical cosine curve. A large portion of the output is beyond the 45 degree line so that glare becomes a considerable factor.

costs but they are not all. Fatigue from excessive contrast ratios, inadequate illumination, fluctuating colors and intensities or, less obviously, negative psychological effects are costs also. As the years pass these costs are more and more being offset by better practice and better equipment, at a greater rate than the monetary costs would seem to indicate. We may use ten times the amount of light our grandfathers did but it costs less than one hundredth of what he would have had to pay in cash in his time.

Looking Ahead

Technically, downlighting equipment and methods today leave much to be desired. Architects are constantly asking for pin spots (generally with apertures of 1½ inches or less) which are bound to be highly inefficient. The number of units required to reduce shadows and reflected glare often makes a complicated and expensive wiring problem. Notwithstanding these limitations, there is a constant demand for downlighting in almost every type of installation.

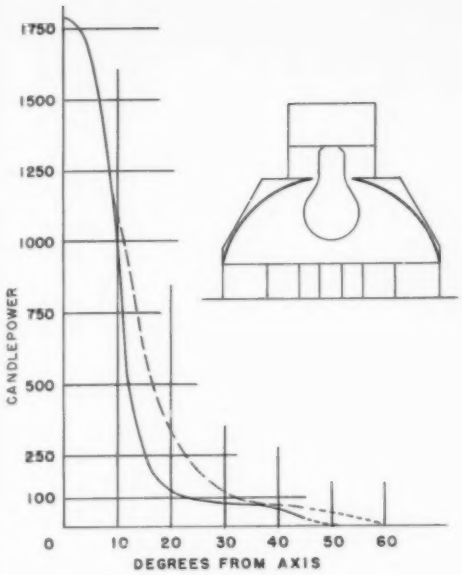


Figure 4A

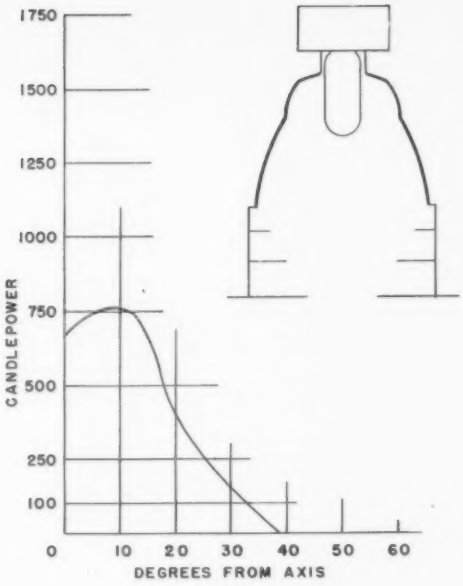


Figure 4B

Figure 4. Reflector type downlights. Parabolic and ellipsoidal reflector units which redirect the rays from a standard service lamp (generally) downward through a ceiling opening. The direct emanation is mostly eliminated by louvers or baffles. The distribution from these units is confined well within the total angle of 90 degrees so that there is very little brightness in the normal line of vision. In this respect practically all the output occurs within the rated beam spread. The ceiling port is somewhat larger than most architects desire except where the ceiling is high (over 25 feet).

4A — Parabolic reflector above eggcrate or concentric louvers. 20 per cent output with louvers, solid line; 35 per cent without louvers, inch line. Primarily this is a narrow beam unit in which practically all the direct emanation from the lamp is eliminated by the louvers. These should be painted flat black. As the size of the lamp increases, the ceiling port becomes unduly large from 10 inches for 100-watt lamps to 24 inches for a 1000-watt lamp.

4B — Ellipsoidal reflector in a can with baffles. Medium spread, 40 per cent output. Baffles eliminate bright side walls in the can. A very general conjugate focal point of the special ellipsoid is at the ceiling port. The unit is deep. 200- to 1000-watt sizes. Ceiling port from five to seven inches in diameter.

4C — A simple open ellipse reflector using a standard service lamp. 55 per cent output. Ideal for group installations with low ceilings 40-100 watts with a 5-inch port. 150-300 watts with a 6-inch port.

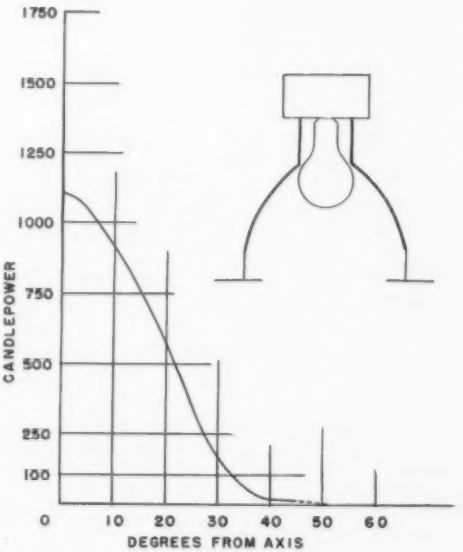


Figure 4C

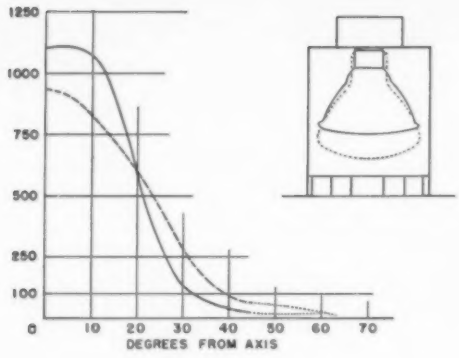


Figure 5A

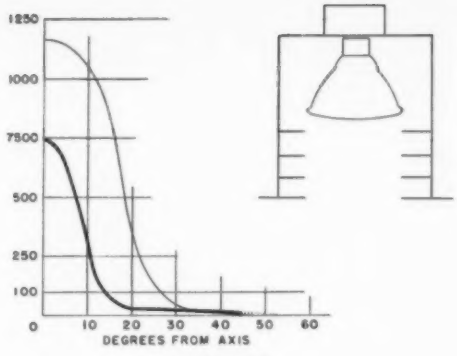


Figure 5B

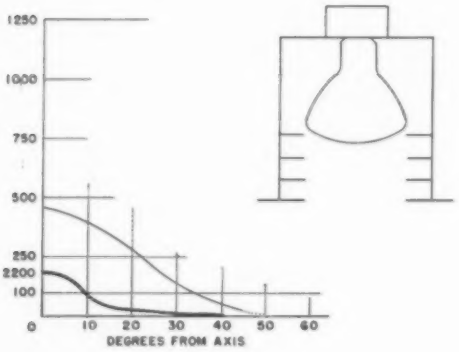


Figure 5C

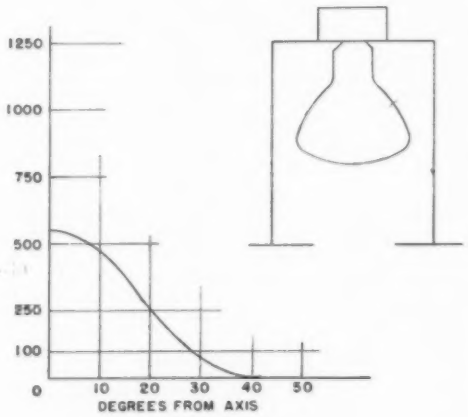


Figure 5D

Figure 5. Reflector lamp units (spot and flood). All the optical control is in the lamp itself. The hood consists of baffles or louvers to cut down internal reflections and to eliminate the view of the lamp. This unit is sometimes called the "High Hat" because of the shape of the can. It requires a relatively large aperture or ceiling port — larger than the lamp — for bottom access. This is the simplest type of downlight that has less than a 90-degree beam spread and at the same time a high efficiency.

5A — Louvered can. 75-watt sizes in a 5-inch can. 150- and 300-watt sizes in a 6-inch can. 15-degree (spot) and 30-degree (flood) beam spreads. PAR-flood, solid line curve up to 75 per cent, R-flood, broken line curve up to 45-60 output depending upon the degree of cutoff provided by the louvers.

5B — Baffle can with PAR lamp. Horizontal baffles eliminate the bright inside of the hood and yet provide a degree of luminosity to make the view of the ceiling port tend to match the ceiling brightness. PAR flood gives 54 per cent output (40 per cent in terms of standard lamp output) and is the standard for this type of unit. Not recommended for ceilings less than twelve feet high. Spot lamp, solid line, at 1/10 standard scale. Effective with high ceilings and close spacing, 75 per cent output (in terms of bare PAR lamps).

5C — Baffle can with R-40 lamp. Similar to B, but with less than half the output. Wider spread and a means of getting less illumination without a dimmer. An R-30 lamp can be used for even less output.

5D — R-12 Pin hole unit. A simple low-output soft-edge unit requiring only a one and one-half-inch port. The 30 per cent efficiency is justified by need for a small port and low intensity in night clubs and similar places. Not recommended for ceilings over 12 feet high.

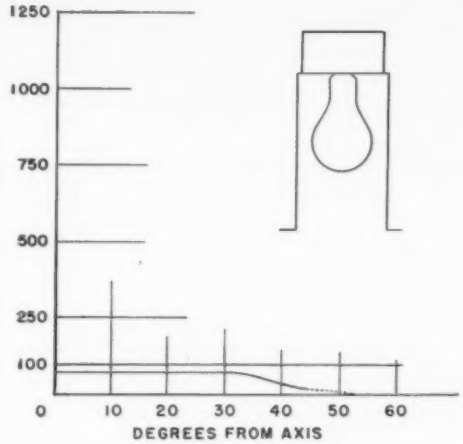


Figure 6A

Figure 6. Miscellaneous downlights. These are shown only because they have such wide use. Their apparent cheapness and efficiency are illusory advantages. In the long run, inefficiency and glare should restrict their use to places where these features are of secondary importance. Compare distribution curves with other type of downlights.

6A — Ceiling can. Usually a general service lamp of any size sunk in the ceiling to hide the lamp from the normal line of vision. It has no optical characteristics and the sides of the can always appear bright, even if painted black. The efficiency and distribution depend upon the depth of the can — from 60 per cent for a shallow can to 20 per cent or less for a deep can.

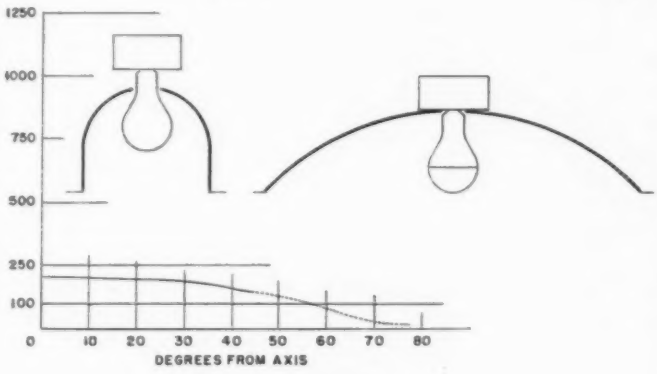


Figure 6B

6B — Flush dome type unit. 60- to 500-watt silver bowl lamps. The surface brightness of these units is high—particularly where the neck of the lamp is not shielded. They give a wide soft-edged distribution which varies from the large reflector giving 60 per cent output to a 20 per cent from a small cup with a louver.

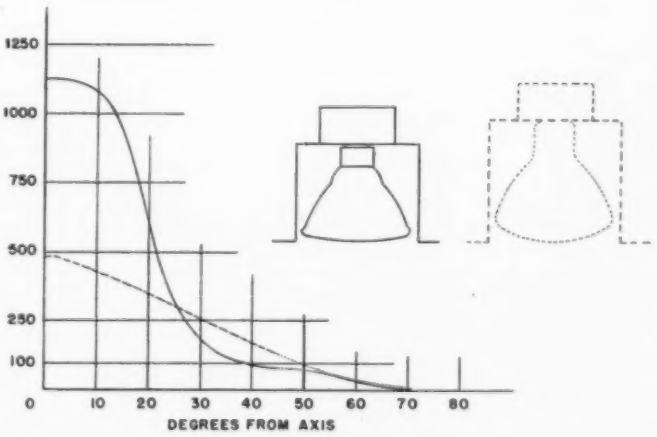


Figure 6C

6C — Flush reflector lamp cans. The surface of the lamp is flush with the ceiling line so that the R lamps lose about 10 per cent of their bare lamp efficiency (which is about 70 per cent of standard A lamp output), and the surface brightness is not as high as the R flood lamp. Spotlight lamps in either type have bare lamp characteristics and give a spotty effect. These units are often used under marquees to give a high level of illumination. This brightness with that of the lamp has considerable display value.

TELECAST

LIGHTING NEWS OF CURRENT INTEREST

Summary of Council Action at December Meeting, New York City

With President Walter Sturrock presiding, the I.E.S. Council held its bimonthly meeting on December 14, 1950, at the Hotel Lexington, New York City. Present were: Walter Sturrock, President; C. H. Goddard, L. E. Tayler, Past-Presidents; S. G. Hibben, E. M. Strong, Vice-Presidents; A. H. Manwaring, General Secretary; R. F. Hartenstein, Treasurer; R. L. Biesele, Jr., Myrtle Fahsbender, Duncan M. Jones, N. D. Macdonald (proxy for L. A. Hobbs), Roy A. Palmer, Hoyt P. Steele, Directors; J. B. Browder, G. F. Dean, Charles N. Laupp, C. O. Martin, J. S. Schuchert, F. C. Winkler, S. B. Williams (proxy for F. A. Covington), Regional Vice-Presidents; A. D. Hinckley, Executive Secretary; C. L. Crouch, Technical Director; Ruby Redford, Acting Editor; Paul H. Hildebrand, C. C. Keller, H. A. Kliegl, and Harris Reinhardt.

Membership

Elections of Associate and Student Members were reported by the General Board of Examiners, and recommendations submitted for the election of Members to the Society. A list of the new members in all grades will be found at the end of the Telecast Section, this issue. Favorable action by Council on the Examiner's report, together with other changes, brings the membership totals to date, as shown in the following tabulation:

September 30, 1950		December 14, 1950
7057	Total Membership	7193
32	Members Emeritus	32*
41	Fellows	44
1610	Members	1631
5005	Associate Members	5098
369	Student Members	388

*Includes 9 Fellows of the Society.

Finance Committee

In the absence of M. N. Waterman, Chairman, Clarence C. Keller reported to Council on the committee's study of a proposal that foreign (specifically Canadian) Sustaining Members support apply directly to the Sections and Chapters in that country, "to offset discount in dues if such a discount is allowed." It was evident from the report on Canadian Sustaining Members dues in relation to individual dues that the effect of reverting funds as proposed would amount to considerable loss of income to the Society. The study of the subject developed from consideration of a joint handling of individual membership dues for members in Mexico together with new Sustaining Memberships to be secured, Canadian experience being used as a test case. Following discussion, action was taken to accept the report, referring the matter to the Local Activities Committee.

Mr. Keller further reported on financial requirements for the Handbook Revision Project, based on recent reviews of the Handbook budget by the Handbook Revision Committee and the Publications Committee. With the estimated peak of expense over income expected to occur between the present time and August 1st, and to be of an order in line with bank balances during that time, the Finance Committee reported it continues to feel that the Handbook is a sound financial project.

Sustaining Members

The report of the Sustaining Membership Committee, submitted by C. C. Shotwell, Chairman, covered the committee's recent study of membership categories and future plans for increasing participation by such members, and recommended the election of:

Clyde Porcelain Steel Corp.
2211 Birdseye Street
Clyde, Ohio
Official Representative: W. J. White

Technical Conferences

R. F. Hartenstein, National Technical Conference Chairman, advised Council of the plans now well underway for the Washington Conference, which will start at 9:30 a.m. on Monday, August 27, 1951, to conclude Thursday night, August 30, with the President's Reception and Banquet. He reported that the details of the Technical Papers Session would be reported to Council at its February 8 meeting, by H. P. Steele, Papers Committee Chairman.

Local Activities

Action was taken to confirm the appointment of some 95 additional Local Representatives to further the Society's work in as many cities and towns throughout the U. S. and Canada.

In further connection with local activity, Prof. E. M. Strong advised that a special study is underway toward the development of several new Chapters, and new Student Branches.

In connection with Regional Conferences scheduled (see Lighting Calendar for dates and places) Prof. Strong reported that his committee had circulated a letter to all Sections and Chapters encouraging "My Most Interesting Job" contests. He indicated that a special set of points for use in a rating scale had been prepared from previous experience with these contests, for their use and guidance.

Advance Planning

Considerable thought and discussion was given by Council to the comprehensive report submitted by the Task Committee on Advance Planning, R. W. Staud, Chairman.

Gist of the report covered the committee's study of the Society's increasing cost of operation on both national and local levels, offering three recommendations involving amendments to the Constitution.

Recommendation No. 1 — that Article VII Section 11 (b) of the Constitution and By-Laws be changed to include an interpretation of the word "minimum" (of reserve) to read "and maintain a minimum reserve in cash and negotiable securities equal to 25 per cent of the current total budgeted annual expenses." Council's discussion indicated a preference for a stipulation that such reserve "shall not go below," and this recommendation was approved for referral to the Committee on Constitution and By-Laws.

Recommendation No. 2 suggested an increase in dues of all grades except Fellow and recommended the establishment of a new grade to be known as "Junior Grade," with an age limit of 29, which would grant all membership privilege except a vote and holding elective office. Council's extensive discussion

to these proposals culminated in their recommendation to the Constitution Committee that Member dues be increased $2.00 each per year; that Associate Member dues be increased by $2.50 per year; that Student Member dues be increased $2.00 per year with no change in Fellow dues; all subject to a membership vote on the next annual ballot. It was further recommended that consideration of the establishment of a new grade of membership be deferred until the report of the Professional Requisites Committee, who are also studying this subject, is available.

Recommendation No. 3, that the present admission fee apply to all grades except Student Member, brought forth the suggestion from Council that the application of entrance fees should be given some study.

Television Lighting

H. A. Kliegl, a member of the I.E.S. Committee on Television Lighting (and Chairman of the I.C.I. Committee on TV) presented his I.E.S. committee's report "Current Lighting for Television Production." Council took action to approve this report for referral to the Publications Committee, with the suggestion that the title be changed to "Current Lighting for Television Program Production."

Another report approved by Council was the report of the Nomenclature Committee, presented by Harris Reinhardt.

Procedures and Policies

Recommendations on four items submitted by the Committee on Procedures and Policy were approved by Council. These covered suggestions governing National Technical Conferences, preparation of illumination performance recommendations of luminaires, Member Emeritus grade, and policy to guide the Board of Nomination in selecting Directors for the Society.

Technical Activity

C. L. Crouch, Technical Director, reported to Council on the progress of the Society's technical program, indicating that a number of committees are nearing completion of important technical committee reports, and numerous other studies are well under way.

In discussion of Mr. Crouch's report, S. B. Hibben noted the increasing importance of technical information to the armed forces. Mr. Crouch indicated the present activity of the Protective Lighting Committee, and its importance in this connection.

LIGHTING CALENDAR

Society Events

February 8, 1951 — Meeting of I.E.S. National Council, New York, N. Y.

March 4-6, 1951 — Southwestern Regional Conference, Driscoll Hotel, Corpus Christi, Texas

March 22-24, 1951 — Pacific Northwest Regional Conference, Davenport Hotel, Spokane, Wash.

April 5, 1951 — Meeting of I.E.S. National Council, Chicago, Ill.

April 9-10, 1951 — Southern Regional Conference, Atlantis Hotel, Miami Beach, Fla.

May 9-12, 1951 — Canadian Regional Conference, Chateau Frontenac, Quebec

May 14, 1951 — Midwest Regional Conference, Des Moines, Iowa

May 24-25, 1951 — Great Lakes Regional Conference, Hotel Gibson, Cincinnati, Ohio

June 14, 1951 — Meeting of I.E.S. National Council, New York, N. Y.

August 27-30, 1951 — Illuminating Engineering Society, National Technical Conference, Hotel Shoreham, Washington, D. C.

Industry Events

January 15-18, 1951 — Plant Maintenance Show, Cleveland, Ohio

January 22-25, 1951 — The American Society of Heating and Ventilating Engineers, 57th Annual Meeting, Philadelphia, Pa.

January 22-26, 1951—Winter General Meeting, American Institute of Electrical Engineers, New York, N. Y.

February 5-7, 1951—National Electric Sign Association Convention and Exhibit, Hotel New Yorker, New York, N. Y.

February 15-16, 1951 — Adequate Wiring Bureau Annual Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio

February 23, 1951 — Inter-Society Color Council, Annual Meeting, Washington, D. C.

March 5-9, 1951—Spring Meeting and Committee Week of the American Society for Testing Materials, Cincinnati, Ohio

March 12-15, 1951 — National Electrical Manufacturers Association, Edgewater Beach Hotel, Chicago, Ill.

April 2-5, 1951 — The American Society of Mechanical Engineers, Spring Meeting, Atlanta, Ga.

April 2-5, 1951 — 17th Annual Sales Conference, Edison Electric Institute, Edgewater Beach Hotel, Chicago, Ill.

April 3-6, 1951 — Greater New York Safety Council 21st Annual Safety Convention & Exposition, Hotels Statler and Governor Clinton, New York, N. Y.

April 8-11, 1951 — The Electrochemical Society Inc. Convention, Washington, D. C.

April 30 - May 2, 1951 — Chamber of Commerce 39th Annual Meeting, Washington, D. C.

April 30 - May 4, 1951 — The Spring 1951 Convention of the Society of Motion Picture and Television Engineers, Hotel Statler, New York, N. Y.

May 7-11, 1951 — National Fire Protection Association, Annual Meeting, Hotel Statler, Detroit, Mich.

May 17-19, 1951 — Public Utilities Advertising Association, Hotel New Yorker, New York, N. Y.

Week of May 20th, 1951 — National Association of Electrical Distributors, Atlantic City, N. J.

May 27-30, 1951 — American Society of Refrigerating Engineers 38th Spring Meeting, Hotel Statler, Detroit, Mich.

June 4-7, 1951 — Edison Electric Institute, 19th Annual Convention, Denver, Colo.

June 11-15, 1951 — The American Society of Mechanical Engineers, Toronto, Ont., Canada

June 18-20, 1951 — Annual Convention of the Canadian Electrical Association, St. Andrews, N. B.

June 25-29, 1951 — Summer General Meeting, American Institute of Electrical Engineers, Royal York Hotel, Toronto, Canada

July 2-4, 1951 — The American Society of Heating & Ventilating Engineers Semi-Annual Meeting, Portland, Oregon

September 11-20, 1951—Building Research Congress, London, England.

September 25-28, 1951 — Fall Meeting, The American Society of Mechanical Engineers, Minneapolis, Minn.

October 8-12, 1951 — 39th National Safety Congress & Exposition of the National Safety Council, Chicago, Ill.

October 15-19, 1951—Fall 1951 Convention of the Society of Motion Picture and Television Engineers, Hollywood-Roosevelt Hotel, Hollywood, Calif.

November 12-15, 1951 — National Electrical Manufacturers Association, Chalfonte-Haddon Hall, Atlantic City, N. J.

November 25-30, 1951 — Annual Meeting, The American Society of Mechanical Engineers, Atlantic City, N. J.

I.E.S. Participates in Occupational Vision Congress

The Georgia Section, Illuminating Engineering Society played a key role in the success of the Third Occupational Vision Congress held October 12 and 13 on the campus of the Georgia Institute of Technology in Atlanta. The conference brought together 135 illuminating engineers, optometrists, ophthalmologists, industrialists, health officials, and educators from a number of States.

Joseph B. Browder, Atlanta, Southern Regional Vice-President of I.E.S., served as a member of the joint program committee, as moderator for a forum on industrial lighting, and as toastmaster at the banquet which was a highlight of the occasion.

The afternoon of the first day was devoted entirely to industrial lighting, with periods being taken up on "What Lighting Does for Industry," "Lighting Equipment," "Quantity and Quality" and "Operation of Lighting Systems."

Serving on the panel were the following members of the Georgia Section, I.E.S.: Paul P. Harrison, division lighting engineer, Sylvania Electrical Products, Atlanta; Frank Keener, industrial lighting specialist, Decatur; Jack M. Murrah, division lighting engineer, Georgia Power Co., Atlanta; and Walter W. Wildeman, manufacturers representative, Atlanta.

Close teamwork among illuminating

At Third Occupational Vision Congress Banquet Speakers Table: L. to R.: Mrs. Joseph B. Browder, Joseph Browder, Atlanta, Regional Vice-President, I.E.S., who presided; Lee Jordan, Milledgeville, Ga. humorist, who spoke; and A. I. Butts, 1st Vice-President, Electric Sales and Service, Atlanta, who introduced the speaker.

engineers, ophthalmologists, lighting and painting engineers and industry in working for the maximum visual well-being of employees was stressed.

In addition to lighting, the subjects of accident control, occupational diseases, and correcting vision to the job were covered in papers by nationally-known authorities.

Among those heard on the program were Arthur K. Peterson, M.D., medical director, R. R. Donnelley & Sons Co., Chicago, Ill.; J. E. Nichols, safety director, Reynolds Metals Co.; Hedwig Kuhn, M.D., Hammond, Ind., internationally-known authority on industrial ophthalmology; John T. Miller, O.D., Columbus, Ga., industrial vision consultant.

John M. Scott, Jr., personnel director, Rocky Mountain Mills, Rocky Mountain, N. C., was among the industrialists on the program. He presented a drama in covering the subject, "A Practical Approach to Occupational Vision" and served as moderator on a panel on "How to Start a Vision Program." Members of the panel were industrialists, ophthalmologists and optometrists.

In addition to the Georgia Section, Illuminating Engineering Society, sponsors for the Congress included the Georgia Optometric Association, the originator, the Georgia Society of Ophthalmology and Otolaryngology, the industrial hygiene division, Georgia State Health Department, the Associated Industries of Georgia, and the Engineering Extension Division, Georgia Tech. Dr. Miller, Optometrist, Columbus, served as chairman of the joint committee.

British Visitors Report Lighting Trends Abroad

A tale of frustrating encounters with official restrictions on building and remodeling in England was told by three visitors from London at a meeting this fall of the Northern California Section, Illuminating Engineering Society, held in San Francisco. The speakers were Ellis Somake, house architect of the Dolcis Shoe Company, a shoe store chain; Hugh Olson, managing director of Courtney, Pope, Ltd., store equipment and lighting fixture manufacturers; and Malcolm Glover, consulting civil engineer and lecturer at the University of Glasgow.

All three dwelt upon the shortages of materials and electric power and the necessity of obtaining licenses for almost all construction, remodeling or redecorating. Electricity is severely rationed and its use for lighting is restricted to not more than 1½ watts per square foot during winter months. In winter, display windows may not be lighted until after closing hours.

"Licensing is something quite foreign to you, I'm sure, and how fortunate you are," Somake, a Fellow of the Royal Institute of British Architects, told the American lighting engineers. "One must obtain a license to build from a local board, which functions for the Board of Works. They are not commercially minded and are not interested that a chain store such as my firm desires to build. A license is not easy to obtain, but if you get a chance to buy a property you must take it, to beat your competitor, even without a license. In one such case we had to cover the walls, which were in extremely bad condition, with expensive drapes because we could not get a license to paint."

Another licensing authority is the Ministry of Town and Country Planning, which is given authority to sanction or reject building projects on grounds of suitability, Mr. Somake said. When the Dolcis Shoe Company wanted to use tropical plants to further the decorative scheme in one remodeling project, also, it found an import license was necessary. With few exceptions, no new building is in progress and authorization can only be obtained for repair of war damage.

Mr. Olson, an electrical engineer graduated from the University of London, was in California to attend the National Technical Conference of the Illuminating Engineering Society at Pasadena. He flew to British Guiana on business after the conference, but returned to San Francisco for the Northern California section meeting.

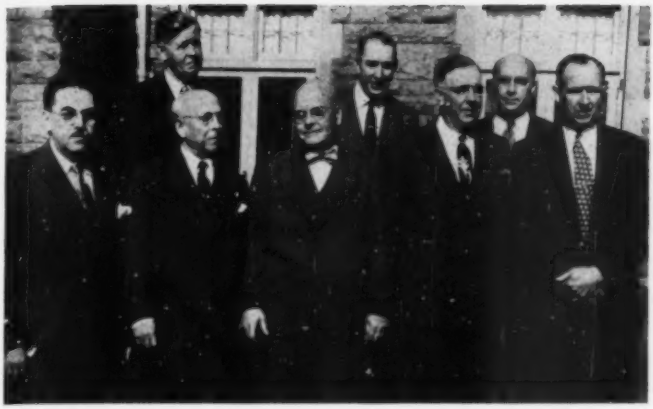
Among handicaps to relighting in London, he said, are voltage and cycle variations in electric service in different parts of the city, a 33 per cent "purchase" or sales tax on all but industrial fixtures and a general unavailability of fixtures.

During the war an 80-watt, five-foot fluorescent lamp was made standard and has become the basis of most luminaires, which limits their use with other lamps. The eight foot slimline is gaining popularity but fixtures for it generally are not available. A tug of war is on between cold and hot cathode lamps. The average intensity of lighting in West End stores is 25 footcandles, with a few lighted to 50 or 75 footcandles. Mr. Olson's firm, Courtney, Pope, Ltd., is relighting the Dolcis shoe chain, which has 220 branches in England and Canada, and has lighted such well-known London stores as Selfridges and Harrod's.

Mr. Glover, the third speaker, received his degree in civil engineering from the University of Glasgow. He is known in Britain as an authority on heavy structural work, having taken part in the construction of foundries, power plants, wharfs and similar structures in Great Britain and on the Continent.

Timber shortage has caused even greater changes in construction practices than the shortage of steel, Mr. Glover said. Shell arches have been forced by the steel shortage, but the timber shortage has made it necessary to use steel forms on big jobs. There is great interest in pre-stressed concrete because of the steel shortage, and even scaffold "boards" one inch thick and 15 feet long have been made of pre-stressed concrete. Structures generally are much lighter than they are in the United States and Canada owing to the shortages of materials.

The appearance of the three English visitors was arranged by John S. Walsh, of the Northern California Section, who served as program chairman. Dr. D. M. Finch, section chairman, presided.



FOUR OF the men in this picture are present also in the photograph below, of the Street and Highway Lighting Committee meeting held in Newark, Ohio twenty years ago. Left to right are (first row) S. R. Williams; C. A. B. Halvorson; G. W. Izant; H. F. Ilgner; O. P. Ortlieb. Second row: F. D. Wyatt; C. H. Rex; and R. M. Zabel. The "oldtimers" are Messrs Harvorson, Izant, Ilgner and Ortlieb, with a fifth (A. A. Dickerson) also present but not shown. Some thirty members of the Street Lighting Committee held a two-day Conference at the Granville Inn, November 14 and 15, 1950.

Twenty Years of Street Lighting Progress

At a meeting of the Street and Highway Lighting Committee, November 14 and 15, held at the Granville Inn, Newark, Ohio, the notable fact was pointed out that five committee members present had also attended a meeting of the same committee at the same place just twenty years ago. And these five men have served continuously on the committee for these twenty years!

The earlier meeting at the Granville Inn, held in July of 1930, approved the first I.E.S. Street Lighting "Code" (now called American Standard Practice). At the 1950 meeting, revisions were completed to bring up to date the 1947 issue of the Street Lighting Practice, and approval reached to release a new (sixth) "Code."

As guests of the Holophane Co., Inc., the committee members made a tour of the city to study the Newark approach to the problem of street lighting. As part of the tour, a demonstration was given of a new automatic recording device for measuring street surface illumination. Drawn by an automobile at eight to ten miles per hour speed, this instrument automatically charts the level of illumination. In a matter of minutes the results in any area can be determined. According to S. R. Williams, Vice-President in Charge of Street Lighting for Holophane, and a member of the committee, this was the first large-scale demonstration of the device in this country.

During the course of the two-day street lighting committee conference, a panel made up of the I.E.S. committee members presented a discussion on street lighting over the local radio station WCLT.

New Payment Plan for Report Subscribers

To simplify further the Report Subscribers' plan which enables members enrolled in the plan to obtain official I.E.S. reports automatically as they are published, the Publications Office offers a new arrangement.

Report Subscribers in the future will not be required to pay for each report as they receive it even though it is accompanied by an invoice. This is merely a record invoice for the subscriber and for Headquarters. Final payment is deferred until the close of the fiscal year, September 30, when the subscriber will be billed for the total number of reports sent to his account during the previous twelve months, eliminating the bother of paying the required small amount for each individual report.

The Report Subscriber plan has been inaugurated so that Society members who have use for them receive each Council-approved report in booklet form upon publication, including Recommended Practices, Lighting for Industry reports, etc. Members may enroll in the Report Subscriber plan by merely writing to the Publications Office, Illuminating Engineering Society, 51 Madison Avenue, New York 10, N. Y.

I.E.S. STREET LIGHTING Committee meeting held at Granville Inn, Newark, Ohio July 29-30, 1930 during which the first I.E.S. Street Lighting Code was drawn up. Five of the men shown have served the committee continuously for twenty years, atending the November 1950 two-day conference at the same place.

Lighting Clinic Featured At Congressional Conference

During the week of November 6 the Librarian of Congress and the Architect of the Capitol at Washington joined forces in calling a five-day conference on office operations. The planning and direction of the affair was done by Mr. A. H. Stricker who is a consultant for the Library of Congress on office operation problems.

The meeting was held in the Whittall auditorium at the Library and was attended by a group, varying from 200-500 of managers of various governmental departments having to do with office operations as well as a considerable number of business representatives from firms having large office operations, manufacturers

Continued on page 10A

Here are the Answers to the most frequently asked questions about the RLM LABEL

Q What do the initials RLM stand for?

A The "R" stands for Reflector, the "L" for Lighting equipment and the "M" for Manufacturers—*Reflector* and *Lighting Equipment Manufacturers.*

Q What does the RLM Label stand for?

A The label affixed to a lighting unit certifies that the reflector meets the minimum specification and performance standards, determined and established by the RLM Standards Institute.

Q Who sponsors the RLM Standards Institute?

A Incorporated as a non-profit organization, the Institute is sponsored by twenty manufacturers who voluntarily elect to manufacture industrial lighting equipment in accordance with RLM Standard Specifications.

Q How are RLM Standard Specifications established?

A The RLM Technical Committee, with the counsel of outstanding illuminating engineers, continuously reviews present specifications and suggests improvements and prepares new specifications. The Committee's recommendations then are reviewed by the Board of Trustees and finally submitted to the Institute Members for ratification. The adoption of new specifications requires approval by at least 80% of the membership.

Q How does the RLM Label assure conformance to RLM Standards?

A Representatives of the Electrical Testing Laboratories periodically visit the plants of all manufacturers participating in the RLM Specification-Certification Program. These ETL inspectors are authorized to take lighting units right off the assembly line or out of stock at random and make the required tests. They may also obtain test samples direct from distributors' stocks in order to check conformance to RLM minimum standards.

Q Who are the Electrical Testing Laboratories?

A Electrical Testing Laboratories, Inc., 2 East End Ave., New York 21, N. Y., is an independent testing organization which has conspicuously served industry for over 50 years. With this impartial and scientific organization rests the sole responsibility of determining whether or not an industrial lighting unit measures up to every individual quality standard that qualifies it to bear the RLM Label.

Q What are the 4 Basic Tests made by Electrical Testing Laboratories?

A (1) Quality of reflecting surface, (2) Reflection factor, (3) Shielding angle and reflector dimensions, and (4) Photometric test for light distribution and efficiency.

Q In addition to design and construction features that meet certain minimum standards, what else does the RLM Label assure the buyer?

A It provides the buyer with a warranty of uniform quality. In addition to the periodical inspections and tests made by the Electrical Testing Laboratories, the manufacturer warrants that every unit shipped by him meets the published specifications of the Institute.

Q How many different types and sizes of RLM Units are there?

A There are 18 basic types of RLM Units and 35 different sizes made by one or more of the 20 member-manufacturers. At present there is available a total of over 250 different makes and types of units which either bear the RLM Label or are on submittal for testing and certification at Electrical Testing Laboratories.

Q How may I obtain free copies of all existing RLM Specifications and a check list of RLM-Member Manufacturers?

A Send for the 44-page RLM Specifications Booklet and the new RLM Bulletin 1050. Write RLM Standards Institute, Suite 823, 326 W. Madison St., Chicago 6, Ill. Your copies will be mailed gladly without cost or obligation.

RLM STANDARDS INSTITUTE INCORPORATED

The letters RLM stand for Reflector and Lighting Equipment Manufacturers

85370

Continued from page 8A

of office equipment, furniture and the like.

One entire day was devoted to the problem of seeing in the office in which the "science of seeing," lighting in general, and methods of obtaining proper lighting in the office were discussed. The speakers at the session were Messrs. Willard C. Brown and Robert L. Oetting of Nela Park. A large amount of demonstration equipment was used to illustrate the various types of light sources, lighting equipment, etc., for the office lighting field.

On each of the succeeding days the following subjects were discussed: Color (by Messrs. Quissenberry and Faber Birren), Air conditioning (by Mr. Leopold), Sound Treatment in the Office, and Safety in Office Operations.

There was great interest and enthusiasm shown by those in attendance and it is possible that this type of "clinic" on the several phases of office operation, including lighting, may be repeated in other parts of the country.

Obituary

Ralph R. Brady, manager of the Westinghouse Lamp Division's commercial engineering department, died December 10 of a blood clot after a two-day illness. Associated with the lamp industry for almost thirty years, Mr. Brady had been especially active in I.E.S. affairs. He was a member of the Committee on

Ralph R. Brady

Aviation Lighting since 1940 and had served as chairman from 1946 to 1949. As a member of the Committee on the National Technical Conference in 1949 he played a major role in the planning of the 1953 conference to be held in New York City.

Mr. Brady was a member of the American Society of Naval Engineers and the Electrical and Gas Association of New York City. He had also served on the United States Committee of the International Commission on Illumination and was active with the Better Light - Better Sight Bureau.

AN INTERESTING application of combined fluorescent and incandescent sources was a feature of the lighting of the turbine room, Sewaren Generating Station of the Public Service Electric and Gas Co., Newark, N. Y. Designed to be a part of the roof girders, these continuous luminaires provide approximately 25 footcandles of illumination over the entire floor area. A combination of 500-watt incandescent lamps and 40-watt fluorescent lamps is used, making a lighting load of about 10 kw per beam.

IT SEEMS TO ME

The Uniform Field and the 3:1 Criterion

To the Editor:

An impression has grown up among lighting engineers that a uniform visual field is required, in the words of the "Q & Q" Committee Report No. 1, "to attain best seeing conditions." Most engineers recognize this as generally impractical in the present state of the art, but many also believe it has been established by scientific research as the "ultimate ideal" of illuminating engineering.

The "uniform field," as the writer understands the idea, is a convenient mathematical device in the analysis of actual non-uniform fields. It is an imaginary reference field with which differing fields can be compared on a common basis.

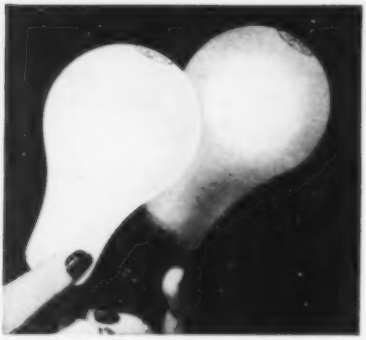
It has no existence, outside of man's imagination, until man artificially creates it. Mankind has no natural experience with it, and is not physiologically adapted to it. There it a great deal of data tending to show that man is not adaptable to a uniform sense field of any sort, whether it be sonic, visual, olfactory, barometric, thermal or proprioceptive, etc. Uniform sense fields result in distress.

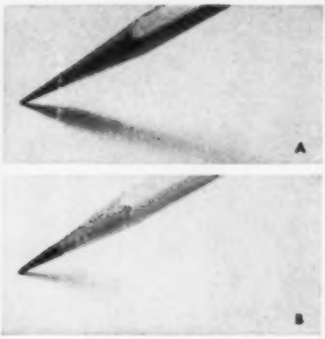
For example, there is no stimulus in a uniform visual field to enable accommodation to take place, so that an observer cannot fixate a line of sight in such a field. Stroboscopic vision in such conditions is impossible. Obviously, uniform visual fields cannot be a valid ideal of illuminating engineers.

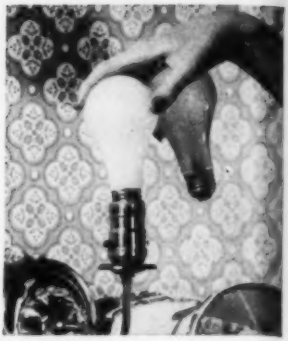
If the term "uniform field" is loosely used in the literature, and is not intended to be understood literally, then it must mean the reverse of what it says. A field is either uniform or non-uniform. No matter how CLOSE the approach to uniformity may be, the field remains a NON-uniform field until there is *no deviation whatsoever from uniform conditions.* If, therefore, the "uniform-field-ideal" is actually a "nearly-uniform-field-ideal," it is, by the same token, a NON-UNIFORM field ideal.

At this point we meet one of the fundamental questions in illuminating engineering: namely, what degree of non-uniformity is optimal? Many engineers have gained the impression that a three to one variation in photometric brightness is the optimal non-uniformity, but such a criterion overlooks the fact that man's responses to visual stimuli are not critical, but operate essentially the same through a range of stimulus variation. This range phenomenon is not con-

Continued on page 13A





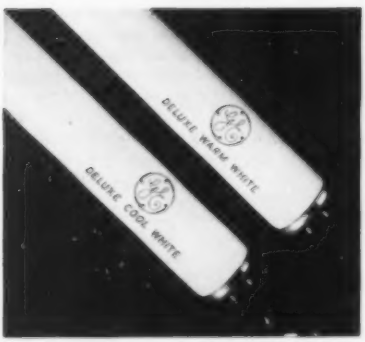


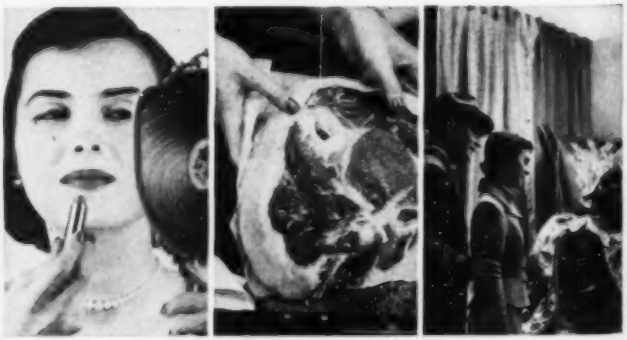
NEW! **A LAMP BULB THAT CUTS REFLECTED GLARE AND SOFTENS SHADOWS**

Photo at left above shows comparison between new G-E 100-watt "White" lamp (left) and ordinary 100-watt lamp (right). Special inside "Q" coating makes the "White" lamp *bright all over!* Result: less glare from glossy surfaces and softer shadows. Pencil-test photos show how new bulb softens shadows. Photo A is with ordinary bulb; B is with new "White" bulb. Picture at right above shows difference in appearance when unlighted.

NEW! **A LAMP THAT BEAUTIFIES CEILING FIXTURES... GIVES SOFTER LIGHT**

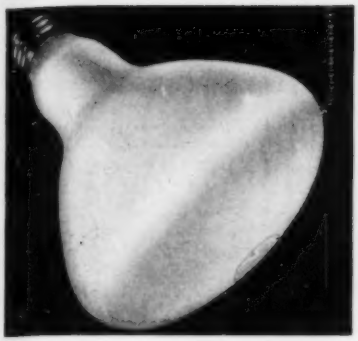
The new 50-GA lamp is specially designed for ceiling fixtures . . . has an attractive new shape that throws indirect light ceilingward, diffuses light down through built-in "filter". It dresses up overhead fixtures in living room, dining room, bedrooms, and halls. Gives a soft, charming effect. Customers are already going for it in a big way—and its future is tremendous.





NEW! **FLUORESCENT LAMPS THAT SHOW COLORS AS THEY REALLY ARE**

These two new G-E fluorescent lamps bring out, for the first time under fluorescent light, the full beauty of *all* colors! Secret is a revolutionary phosphor. Complexions glow with new loveliness, foods look more tempting, fabrics take on new richness. These two new lamps—DeLuxe Cool White for cool effect, DeLuxe Warm White for warm effect—broaden the market for G-E fluorescent lamps wherever color is important.



NEW! **A 3-LITE LAMP THAT GIVES BETTER LIGHT, STAYS BRIGHT**

Because of its special shape and inside "Q" coating, the new R-40 3-lite bulb in table lamps gives an ideal balance of up-and-down light. Shadows are softer, glare reduced. The R-40 3-lite bulb (50-100-150-watts) is used in new table lamps with wide harps like the one above. Special adapters are available to convert old lamps. It opens the way to indirect lighting at moderate cost.

4 new General Electric lamps throw a NEW light on your '51 business!

THESE four new General Electric lamps are on the market now—to help you serve your customers better. Their many advantages open the way to new standards in lighting. And already, these new lamps have gained wide acceptance among consumers everywhere.

So be sure to count on General Electric's new "White" lamps, new "full color" fluorescent lamps, new 50-GA lamps, and new 3-lite lamps to broaden your market for better lighting during '51 and the years to come.

Remember, you can always look to General Electric lamp research for the big *news* in lighting.

LAMPS

GENERAL ELECTRIC

Continued from page 10A

fined to the visual sense but extends through all sense reactions. In other words sense responses are blunt, rather than sharp, and do not change until the stimulus change reaches a certain magnitude. They are not fixed but functional, varying with certain special conditions. It is very fortunate for mankind that this is so, otherwise the slightest change in environment would require internal adjustments, and man's energy would be largely taken up adjusting to the environment, leaving little for useful work.

This bluntness and functional nature of the visual response is well illustrated by Weston's experiments in which for example he found a visual performance rate of 98% for a one-minute detail with a 20% reflectance difference, through a range of illumination levels running from 50 to 100 footcandles. If man's responses to brightness was fixed Weston would have found that the 98% rate for the task described would occur at only one level of illumination, say 75 footcandles, but the same rate of performance actually ocurred at levels as low as around 50, and was still the same rate near 100.

Some work has been done by various investigators on the comfort-discomfort threshold. Some of this work indicates that a brightness on the line of sight that is 50% of the comfort-discomfort threshold brightness will be found comfortable by over 90% of observers. On this basis, if a person is adapted to a 50-footlambert brightness level he will find a brightness on his line of sight to be comfortable when it runs six times as high. That is, in this case a ratio of six to one is within his optimum range. And if the glare source is on the edge of his field a ratio of 96 to 1 is comfortable. This is on the severe basis that the light source occupies 1% of the field of view. Most entire lighting systems run less than this.

If we take a more representative situation, such as an adaptation level of 30 footlamberts, and a source of brightness that is 0.75% of the field, we find that a range of brightness ratios running from 9 to 1 on the line of sight, to 144 to 1 at the edge of the field, will be found comfortable by over 90% of the people.

These examples illustrate the operation of the range factor in brightness contrast response and demonstrate the unreality of the fixed three-to-one rule as far as artificial lighting practice of today is concerned. Present comfort-discomfort data indicate that the conditions in which a 3 to 1 brightness ratio is desirable for visual comfort do not *begin* to occur until the adaptation level passes 300 footlamberts.

It is questionable policy to penalize present-day practice and pocketbooks by a rule that has no application to the adaptation levels that are generated by present-day practice, or that are likely to be generated for a long time to come.—HENRY L. LOGAN, *Vice President in Charge of Research, Holophane Company, Inc., New York, N. Y.*

Lighting Photographs

To the Editor:

Recently I have participated in a number of discussions in committees and in connection with ILLUMINATING ENGINEERING and other publications in which the matter of lighting photographs has been discussed. The mass of misinformation, misunderstanding, and tradition that appears to exist on the subject of lighting photographs apparently overpowers the fact that a rather complete and practical discussion of the subject is included in the IES Lighting Handbook on pages 14-14 to 14-19 of the section on photography.

Because this information is so easily available to most readers of I. E., I will not attempt to review it here. I shall, however, quote as follows from page 14-17 IES Lighting Handbook:

"Because of the limitations in the photographic process, particularly in paper prints, which are of most practical interest, the photographer should make his negatives with certain precautions. If proper reproduction of both highlights and shadows is desired, it is important to keep the maximum brightness range of the subject below one hundred to one. It is important also to reduce lighting contrasts in the scene to allow for adaptations made by the eye as it scans the scene.

"Therefore, *it may be necessary to add supplementary illumination to the darker parts of the scene to obtain a photograph that approaches the visual impression of the scene.* The photography of a near-by face in sunlight illustrates the point—facial shadows are not noticed in the original subject but in photographs they seem unnaturally dark. If the surroundings of the principal illuminated object or the shadows in it are important, additional light is needed, but must be added in such a way that the intended effect is not spoiled. In such cases the rendering is much improved by light added to the shadows by reflectors or by a flashlamp or tube at the camera." The bold face type is suggested for emphasis.

My reason for bringing this to the attention of the readers of ILLUMINATING ENGINEERING is to offset the belief that is so firmly held by some people that supplementary lighting is not permissible when making a photograph intended to render an accurate impression of a lighting installation.

In pointing up this feature of lighting installation photographs, it should be realized that the supplementary lighting required to produce good rendition should not be permitted to introduce shadows into the picture which do not exist as a result of the characteristics of the initial lighting installation itself, nor should the supplementary lighting be used to distort the visual impression of the job.

It should also be appreciated that the reproduction of a photograph by one of the various printing processes may again require some manipulation if the rendition is to be in keeping with that of the original print. In many cases, particularly when a half tone screen is used, a certain amount of retouching of the original print is necessary if the reproduction achieved through the printing process is to give the reader an accurate impression of the appearance of the installation.

It may be of interest to readers of ILLUMINATING ENGINEERING to know that every one of the illustrations in the IES Lighting Handbook were retouched in order to achieve the best practical rendition of the impression created by the original photographs.—ROBERT W. MCKINLEY, *Pittsburgh Corning Corp., Pittsburgh, Pa.*

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At the meeting of the Council Executive Committee held in New York City, December 14, 1950, the following were elected to membership:

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Continued on page 27A

it's well worth Seeing.....

The efficiency and flexibility of standard Pittsburgh Permaflector Lighting Equipment make possible made-to-order illumination at foot candle levels required for each particular job.

There are units designed for overall fluorescent or incandescent illumination, for spotlighting and floodlighting, and for special effects and accents.

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1. Evenly distributed, glare-free light with exceptionally low brightness contrasts.

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An Illumination Survey by a registered professional electrical engineer shows brightness ratios well below those of I.E.S. Recommended Practice of Office Lighting. For example: from 1.4 to 1 to 1.1 to 1 between task and wall; 2.2 to 1 maximum between luminous ceiling and wall.

For a copy of this survey, and for complete information on all phases of the Wakefield Ceiling, write to The F. W. Wakefield Brass Company, Vermilion, Ohio.

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The Wakefield Ceiling will be distributed through licensed agents and installed by factory-trained licensed installers. Planning will be done through electrical engineers and architects. Drawings submitted to Wakefield will be interpreted by job engineers into drawings, bills of material and quotations.

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Fluorescent sources are suspended from structural members above. Diffusion is provided by translucent corrugated acrylic plastic sheets. Suspended below these sheets, at 36" intervals, are perforated acoustical baffles, wedge-shaped in cross section and filled with sound absorbing material.

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Gleason-Tiebout Glass Co.
59-50 54th St., Maspeth, N. Y.
Charles W. Gleason

Globe Lighting Products Co., Inc.
397 Seventh Ave., Brooklyn, N. Y.
Isidor Rosenblatt

Godfrey and Wing, Inc.
3141 Superior Ave., Cleveland 14, Ohio
C. G. Wing

Golde Manufacturing Co.
1214 West Madison, Chicago 7, Ill.
E. W. Goldberg

Grand Rapids Store Equip. Co.
1340 Monroe Ave., N. W., Grand Rapids 3, Mich.
Kenneth C. Welch

Graybar Electric Co., Inc.
420 Lexington Ave., New York 17, N. Y.
Raymond C. Kinney

Gulf States Utilities Co.
Box 2951, Beaumont, Texas
Clarence Barron

The Edwin F. Guth Co.
2615 Washington Ave., St. Louis 3, Mo.
Fred E. Guth

The Hankins Container Co.
3044 W. 106th St., Cleveland 11, Ohio
Ray T. White

Hartford Electric Light Co.
266 Pearl St., Hartford 3, Conn.
Victor Ouellette

Hawkins Electric Co.
1447 Washington Blvd., Chicago 7, Ill.
R. R. Hill

Hendrickson-Heffernan Co., Inc.
45-17 Pearson St., Long Island City 1, N. Y.
Joseph T. Manuccia

Holdsclaw Co.
2301 Scranton Rd., Cleveland 13, Ohio
H. E. Ingraham

Holophane Company, Inc.
342 Madison Ave., New York 17, N. Y.
H. L. Logan

Home Light and Power Co.
810 Ninth St., Greeley, Colo.
C. Gilbert Dresser

House-O-Lite Corporation
1100 West Washington Blvd., Chicago 7, Ill.
Jack R. Stone

Houston Lighting & Power Co.
P.O. Box 1700, Houston 1, Texas
W. J. Aicklen

Hub Electric Company
2219 W. Grand Ave., Chicago 12, Ill.
I. M. Pirman

Hydro-Electric Power Comm. of Ont.
620 University Ave., Toronto, Ontario.
R. L. Hearn

Hyland Electrical Supply Co.
700 West Jackson Blvd., Chicago, Ill.
J. A. Tills

Illinois Power Co.
184 East Main St., (L Box 511 B), Decatur 70, Ill.
Allen Van Wyck

Illuminating Engineering Co.
3247 E. Nine Mile Road, Hazel Park, Mich.
Bert O. Pretzer

Iowa Electric Light & Power Co.
Box 351, Cedar Rapids, Iowa
Sutherland Dows

Iowa-Illinois Gas & Electric Co.
United Light Bldg., Davenport, Iowa
John M. Hollingsworth

Iowa Power and Light Co.
312 Sixth Ave., Des Moines 3, Iowa
N. Bernard Gussett

Iowa Public Service Co., East Div.
400 Commercial St., Waterloo, Iowa
C. R. Wagoner

Iowa Public Service Co.
Sioux City Division
P.O. Box 778, Sioux City 4, Iowa
C. R. Tracy

Jeannette Shade & Novelty Co.
N. Fourth St., Jeannette, Pa.
H. N. Orock

Jefferson Electric Co.
Bellwood, Ill.
L. Maserer

Jersey Central Power & Light Co.
501 Grand Ave., Asbury Park, N. J.
D. J. Douglas

Joleco Corporation
2513 Baldwin St., St. Louis, Mo.
George Ledbetter

Jones Metal Products Co.
West Lafayette, Ohio
H. Boyer

Joslyn Mfg. & Supply Co.
3700 So. Morgan St., Chicago 9, Ill.
J. H. Fahey

Kansas City Power & Light Co.
P.O. Box 679, Kansas City 10, Mo.
John M. Arthur, Jr.

Kansas Gas & Electric Co.
P.O. Box 204, Wichita, Kans.
H. W. Hobson

The Kayline Company
2490 E. 22nd St., Cleveland 15, Ohio
M. A. Eskins

Kelso-Burnett Electric Co.
223 W. Jackson Blvd., Chicago 6, Ill.
Sigmund A. Hollinger

Kerrigan Iron Works, Inc.
1033 Herman St., Nashville, Tenn.
G. E. Daniels

Keystone Electric Manufacturing Co.
2328-36 E. Tioga St., Philadelphia 34, Pa.
Leonard M. Siegel

The Kirlin Company
3435 E. Jefferson Ave., Detroit 7, Mich.
Ivan Kirlin

Kopp Glass, Inc.
Swissvale, Pa.
F. C. Ashe

The La Salle Lighting Products, Inc.
145 Seneca St., Buffalo 3, N. Y.
Richard C. Piper, Jr.

Leader Electric Manufacturing Corp.
3500 N. Kedzie St., Chicago 18, Ill.
Walter Glass

The Leeds & Northrup Co.
4901 Stenton Ave., Philadelphia 44, Pa.
I. M. Stein

Libbey Owens Ford Glass Co., Plaskon Division
2112-24 Sylvan Ave., Toledo, Ohio
Dr. M. H. Bigelow

Light Control Company
3217 Casitas Ave., Los Angeles 26, Calif.
Stanley B. Lindahl

Lighting & Lamps
114 East 32nd St., New York 16, N. Y.
James Krieger

Lighting, Incorporated
3412 Grandview St., Los Angeles, Calif.
Harry Marsh

Lighting Products, Inc.
2259 W. Park Ave., Highland Park, Ill.
D. B. Dunne

Lightolier Co.
11 East 36th St., New York 16, N. Y.
H. Stollnitz

Line Material Co.
Division of McGraw Electric Co.
800 North 8th St., Milwaukee 1, Wis.
M. C. Hersh

Litecontrol Corp.
96 Pleasant St., Watertown 72, Mass.
Paul H. Lamson

Lithonia Lighting Products Co. Inc.
Lithonia, Georgia *Robert J. Freeman*

Louisiana Power & Light Co.
142 Delaronde St., Station "A," New Orleans, La. *C. L. Osterberger*

Luminator, Inc.
130 N. Peoria St., Chicago 7, Ill.
Albert L. Arenberg

T. R. Lyda Manufacturers Rep.
4922 Washington Blvd., Indianapolis, Ind.
T. R. Lyda

Lynn Gas & Electric Co.
90 Exchange St., Lynn, Mass. *James A. Cook*

Macbeth Corp.
P.O. Box 950, Newburgh, N. Y.
Norman Macbeth

Malden Electric Co.
157 Pleasant St., Malden, Mass.
Donald E. Bennett

Markel Electric Products, Inc.
139-14d Seneca St., Buffalo 3, N. Y.
Morris L. Markel

La Cie Martineau Electrique Ltee.
14 rue du Roi, Quebec, Canada
Henri Martineau

Metalcraft Products Company
306-08 Cherry St., Philadelphia 6, Pa.
Nathan Bloom

Metal Window Institute
Cheltenham, Pa. *George Hingston*

Metropolitan Edison Co.
413 Washington St., Reading, Pa.
T. O. McQuisten

Metropolitan Electrical Supply Co.
20 N. Jefferson St., Chicago 6, Ill.
H. J. Priest

Midwest Chandelier Co.
15th & Centry Sts., No. Kansas City 16, Mo.
Sidney Lefkovits

The Miller Co.
Meriden, Conn. *G. W. Beals*

Mississippi Glass Co.
99 Angelica St., St. Louis 7, Mo. *Reed Muir*

Mississippi Power Co.
Gulfport, Miss. *R. M. Shearer*

Mississippi Power & Light Co.
Lampton Building, Jackson, Miss. *Les Taylor*

Mitchell Manufacturing Co.
2525 Clybourn Ave., Chicago 14, Ill.
Bernard Mitchell

Modern Light Company
911 Locust St., St. Louis 1, Mo. *J. E. Baker*

Modern Light & Equip. Co.
9812 S. Wabash Ave., Chicago, Ill.
M. L. Ofenberg

Moe-Bridges Corp.
1415 Illinois Ave., Sheboygan, Wis.
M. B. Deutsch

Montana-Dakota Utilities Co.
831 Second Ave. So., Minneapolis 2, Minn.
W. L. Hayes

Municipal Light and Power Dept.
City of Pasadena, California, 302 City Hall, Pasadena 1, Calif. *E. L. Bettannier*

Mutual Sunset Lamp Mfg. Co., Inc.
540 Empire State Bldg., New York 1, N. Y.
Morris Thau

The Narragansett Electric Co.
49 Westminster St., Providence 1, R. I.
C. R. Broadhead

National Chemical & Manufacturing Co.
Luminall Paint Div.
3617 So. May St., Chicago 9, Ill.
John Marshall Zic

National Lighting Products
4221 W. Harrison St., Chicago 24, Ill.
D. J. Epp

Nelson-Tombacher Co.
81 Prospect St., Brooklyn, N. Y.
M. J. Tombacher

New Bedford Gas & Edison Light Co.
693 Purchase St., New Bedford, Mass
W. S. Fenstermacher

New Orleans Public Service, Inc.
317 Baronne St., New Orleans, La.
S. L. Drumm

Niagara Mohawk Power Corp.
300 Erie Blvd. W., Syracuse 2, N. Y.
Leland D. McCormac

Northern Electric Co. Ltd.
1620 Notre Dame St., West, Montreal, Quebec.
F. P. Labey

Northern Indiana Public Service Co.
5265 Hohman Ave., Hammond, Inc.
J. C. Sackman

Northern Light Company
2051 N. 19th St., Milwaukee, Wis.
Fred Cramer

Northern States Power Co.
Minneapolis 2, Minn. *Carl T. Bremicker*

Ohio Edison Co. (Akron Div.)
Akron 8, Ohio *C. L. Dunn*

The Ohio Power Co.
301-315 Cleveland Ave., S. W., Canton 2, Ohio
C. B. Morin

The Ohio Public Service Co.
P.O. Box 6058, Cleveland 1, Ohio.
C. L. Dunn

Oklahoma Gas & Electric Co.
Box 1498, Oklahoma City 1, Okla.
E. W. Gray

Omaha Public Power District
720 Electric Bldg., Omaha 2, Nebraska
E. E. Schweim

Overbagh & Ayres Mfg. Co.
411 S. Clinton St., Chicago 77, Ill.
Alfred A. Overbagh

Pacific Gas & Electric Co.
245 Market St., San Francisco 5, Calif.
O. R. Doerr

Pacific Power & Light Co.
822 Public Service Bldg., Portland 4, Oregon
C. A. Root

Peerless Electric Ltd.
1090 Pratt Ave., Outremont, Quebec.
L. A. Van Duzer

Pennsylvania Electric Co.
535 Vine St., Johnstown, Pa.
Frank R. Knowles

Pennsylvania Power Co.
19 E. Washington St., New Castle, Pa.
P. G. Dingledy

Pennsylvania Power & Light Co.
901 Hamilton St., Allentown, Pa.
J. M. Stedman

Pennsylvania Wire Glass Co.
1612 Market St., Philadelphia 3, Pa.
Dr. Frank W. Preston

The Perfectlite Company
1457 E. 40th St., Cleveland, Ohio
Joseph L. Jaffe, Jr.

Philadelphia Electric Co.
1000 Chestnut St., Philadelphia 5, Pa.
H. B. Bryans

Philadelphia Electrical & Mfg. Co.
1200-36 N. 31st St., Philadelphia 21, Pa.
R. A. Manwaring

Phoenix Glass Co.
Monaca, Pa. *D. G. Cameron*

Pierce Electric Co.
367 West Adams St., Chicago 6, Ill.
John H. Pierce

Pittsburgh Corning Corp.
307 Fourth Ave., Pittsburgh, Pa.
Robert W. McKinley

Pittsburgh Plate Glass Co.
Grant Bldg., Pittsburgh 19, Pa.
R. B. Tucker

Pittsburgh Reflector Co.
403-411 Oliver Bldg., Pittsburgh 22, Pa.
H. C. Zimmeister

Portland General Electric Co.
Electric Bldg., Portland 5, Ore. *T. W. Pilch*

The Potomac Edison Co.
55 E. Washington St., Hagerstown, Md.
S. S. Bradford

Public Service Co. of Colo.
900 Fifteenth St., Denver, Colo. *G. B. Buck*

Public Service Co. of Indiana, Inc.
110 N. Illinois St., Indianapolis 9, Ind.
G. O. Stewart

Public Service Co. of Northern Illinois
72 West Adams St., Chicago 3, Ill.
G. K. Hardacre

Public Service Co. of Oklahoma
Box 201, Tulsa 2, Okla. *C. N. Robinson*

Public Service Electric & Gas Co.
80 Park Place, Newark 2, N. J.
H. P. J. Steinmetz

Puget Sound Power & Light Co.
860 Stuart Bldg., Seattle 11, Wash.
Frank McLaughlin

Quadrangle Mfg. Co.
32 So. Peoria St., Chicago 7, Ill.
Dwight B. Worrell

Quaker City Electric Mfg. Co.
2810 East Pacific St., Philadelphia, Pa.
Reuben Huberman

Quebec Hydro-Electric Commission
107 Craig St., West, Montreal, Que.
Paul E. Poitras

Quebec Power Co.
229 St. Joseph St., Quebec, Que.
Jean Saint-Jacques

Rambusch Decorating Co.
40 W. 13th St., New York 11, N. Y.
Edward Rambusch

Revere Electric Mfg. Co.
6009-17 N. Broadway, Chicago 40, Ill.
Van N. Marker

Revere Electric Supply Co.
757 West Jackson Blvd., Chicago, Ill.
Floyd Forman

Rochester Gas & Electric Corp.
89 East Ave., Rochester 4, N. Y.
Frank C. Taylor

Rockland Light & Power Co.
Nyack, N. Y. *D. S. Eckaab*

Rohm and Haas Co.
222 W. Washington Sq., Philadelphia 5, Pa.
F. W. Totsiaf

Ruby-Phillite Corp.
32-02 Queens Blvd., Long Island City 1, N. Y.
Louis Phillips

Rumsey Electric Co.
1007 Arch St., Philadelphia 7, Pa.
T. W. Lauer

Ryall Electric Supply Co.
1160 Stout, Denver, Colo. *C. O. Ryall*

The Safety Car Heating & Lighting Co.
P.O. Box 904, New Haven 4, Conn.
J. J. Kennedy

St. Joseph Ry., Light, Heat & Power Co.
520 Francis St., St. Joseph 2, Mo.
P. P. O'Connor

Sandee Manufacturing Co.
5050 Foster Ave., Chicago, Ill.
Curtis N. Sprankle

Sandel Manufacturing Co.
3618 So. Loomis Place, Chicago 9, Ill.
A. L. Sandel

San Diego Gas & Electric Co.
P.O. Box 1831, San Diego 12, Calif.
A. E. Holloway

Savannah Electric & Power Co.
Savannah, Ga.
J. L. Davidson

Schockett Electric Co.
1061 Broadway St., Denver 3, Colo.
Carl Schrens, Jr.

Schomer Electric Supply
164 S. Broadway, Aurora, Ill.
Daniel Schomer

The Albert Sechrist Mfg. Co.
1717 Logan St., Denver 5, Colo.
K. L. Francis

L. J. Segil Co.
2500 W. North Ave., Chicago, Ill.
Louis Rosenstein

Shawinigan Water and Power Co.
600 Dorchester St., W., Montreal, Que.
J. K. Wilson

The Sherwin-Williams Co.
101 Prospect Ave., N. W., Cleveland 1, Ohio
J. A. Moncham

The Sight Light Corp.
P.O. Drawer C, Deep River, Conn.
E. L. Caufield

Silvray Lighting, Inc.
R. K. O. Bldg., Radio City, New York 20, N. Y.
J. M. Gilbert

A. L. Smith Iron Co.
217 Everett Ave., Chelsea, Mass.
Joseph Fishman

Smoot-Holman Co.
321 No. Eucalyptus Ave., Inglewood, Calif.
L. A. Hobbs

Sola Electric Co.
4633 W. 16th St., Chicago 50, Ill.
L. C. Marschall

Solar Light Mfg. Co.
1357 S. Jefferson St., Chicago 7, Ill.
A. Lasersen

The Solex Co. Ltd.
980 Fallon St., West, Montreal, Que.
Leon Beauchamp

Southern Calif. Edison Co., Ltd.
601 West 5th St., Los Angeles 53, Calif.
Roy E. Dahlin

Southern Canada Power Co. Ltd.
355 James St., West, Montreal, Que.
George R. Atchinson

Southern Colorado Power Co.
Box 75, Pueblo, Colo.
O. W. McAllen

Southern Indiana Gas & Elec. Co.
P.O. Box 549, Evansville 3, Ind.
C. K. Graham

Southern Lighting Mfg. Co.
P.O. Box 3546, Orlando, Fla.
Max K. Aulick

Southwestern Gas & Elec. Co.
Box 1106, Shreveport, La.
J. E. Elliott

Southwestern Public Service Co.
Amarillo, Texas
J. E. Cunningham

The Spero Electric Corp.
18232 Lanken Ave., Cleveland, Ohio
Herbert I. Spero

Stanley Electric Mfg. Co.
8001 Laycock St., Philadelphia 42, Pa.
Bernard S. Heller

Steber Manufacturing Co.
2700 Roosevelt Rd., Broadview, Maywood, Ill.
T. L. D. Lynzwiler

Steiner Electric Co.
3500 Milwaukee Ave., Chicago 41, Ill.
George S. Steiner

Sterling Reflector & Mfg. Co.
3249 West Grand Ave., Chicago 51, Ill.
Anton Oberhuber

Stone Manufacturing Co.
489 Henry St., Elizabeth 4, N. J.
Burt Wadams

Sunbeam Lighting Co.
777 E. 14th Place, Los Angeles 11, Calif.
Herbert L. Krieger

Sun-Lite Manufacturing Co.
2555 Bellevue Ave., Detroit 7, Mich.
Fred Binder

Sun-Ray Fluorescent Co.
600 South Michigan Ave., Chicago, Ill.
Jerome Gimbel

Sylvania Electric Products, Inc.
1740 Broadway, New York 19, N. Y.
D. P. Caverly

Tampa Electric Co.
Case & Tampa Sts., Tampa 1, Fl.
F. J. Gannon

Frank C. Teal Co.
3222-24 E. Jefferson, Detroit 7, Mich.
Harold C. Smith

Texas Electric Service Co.
Electric Bldg., Fort Worth 1, Texas
R. E. Hendricks

Thompson Electric Co.
1101 Power Ave. N. E., Cleveland 14, Ohio
Thayer B. Purrington

Thompson-Wilson Company
737 Spring St., N. W., Atlanta, Ga.
Thomas A. Willis

Toledo Edison Co.
Edison Bldg., Toledo 4, Ohio
Charles A. Harrison

Toronto Hydro-Electric System
14 Carlton St., Toronto 2, Ont.
A. W. J. Stewart

Torstenson Glass Co.
3233 N. Sheffield Ave., Chicago 13, Ill.
Elmer L. Torstenson

Triangle Industries
600 W. Adams St., Chicago, Ill.
Leonard Cohen

Tri-Part Mfg. Company
934 Plum St., Detroit 1, Mich. *Julius Resnik*

Tristate Electrical Supply Co., Inc.
38 S. Potomac Street, Hagerstown, Md.
Robert A. Stott

Tru-Lite Ltd.
824 Notre Dame St., W., Montreal, Que.
Omer M. Trudel

Underwriters' Laboratories, Inc.
207 E. Ohio St., Chicago 11, Ill.
Ferd. Neumer

Union Electric Co. of Missouri
12th & Locust Sts., St. Louis 1, Mo.
W. L. Berry

Union Metal Mfg. Co.
Canton 5, Ohio *W. A. Porterfield*

Unistrut Corp.
4118 Monroe Ave., Wayne, Mich.
James W. Attwood

The United Illuminating Co.
80 Temple St., New Haven 6, Conn.
E. B. Haskell

United Manufacturing Co.
Div. United Advertising Corp.
190 Whalley Ave., New Haven, Conn.
William E. Harris

Utah Power & Light Co.
Box 899, Salt Lake City 10, Utah
W. A. Huchins

Verd-A-Ray Corp.
615 Front St., Toledo 5, Ohio *O. S. Lee*

John C. Virden Co.
6009-6103 Longfellow Ave., Cleveland 3, Ohio
W. G. Sawyer

John C. Virden, Ltd.
35 Front St., East, Toronto, Ont.
P. G. Kirkpatrick

Virginia Electric & Power Co.
Richmond, Va. *J. G. Holtzclaw*

Voigt Co.
1649 No. Broad St., Philadelphia 22, Pa.
C. J. Frank

The F. W. Wakefield Brass Co.
Vermilion, Ohio *A. F. Wakefield*

Warren Electric Co.
P.O. Box 2594, Houston, Texas
J. E. Thompson

The Washington Water Power Co.
P.O. Drawer 1445, Spokane 6, Wash.
Carl L. Hoffman

The Watson Standard Co.
225 Galveston Ave., Pittsburgh 12, Pa.
J. V. Borland

Welsbach Engineering and Management Corp.
1500 Walnut St., Philadelphia 2, Pa.
H. H. Adams

Westinghouse Electric Corp.
1216 W. 58th St., Cleveland 1, Ohio (P.O. Box 5817) *W. F. White*

Westinghouse Electric Supply Co.
113 North May St., Chicago 7, Ill.
Henry Cook

Westinghouse Lamp Div.
Bloomfield, N. J. *Samuel G. Hibben*

West Penn Power Co.
14 Wood St., Pittsburgh 30, Pa.
Harry Restofski

Wheeler Reflector Co.
275 Congress St., Boston 10, Mass.
K. A. South

Wiedenbach-Brown Co., Inc.
111 Eighth Ave., New York 11, N. Y.
W. C. Stockberger

R. & W. Wiley, Inc.
119 Dearborn St., Buffalo 7, N. Y.
H. B. Aldermann

H. E. Williams Products Co.
103 S. Main St., Carthage, Mo.
F. B. Williams, Jr.

Wilmot Castle Co.
1255 University Ave., Rochester 7, N. Y.
E. H. Greppin

J. A. Wilson Lighting & Display Ltd.
280 Lakeshore Rd., Toronto 14, Ont.
J. A. Wilson

The Windsor Utilities Comm., Hydro Div.
149 Chatham St., W., Windsor, Ont.
W. A. Shaw

The Wiremold Company
Hartford 10, Conn. *D. Hayes Murphy*

Wisconsin Electric Power Co.
Public Service Bldg., Milwaukee 1, Wis.
G. W. Van Dorne

Wisconsin Gas & Elec. Co.
100 Third St., Racine, Wis. *J. H. Dunham*

Wisconsin Power & Light Co.
122 W. Washington Ave., Madison 1, Wis.
J. D. Howard

Wisconsin Public Service Corp.
Green Bay, Wis. *A. G. Bur*

Worcester County Electric Co.
11 Foster St., Worcester, Mass.
Fred R. Littlefield